

MODERN Machine Shop

HOWARD CAMPBELL, Editor

Volume 8

APRIL, 1936

Number 11

CONTENTS

| | |
|---|-----|
| MACHINE OPERATIONS IN A SHIPBUILDING PLANT..... | 33 |
| By Howard Campbell | |
| RESISTANCE OF WELDED MACHINE STRUCTURES TO VIBRATION | 44 |
| By Robert Tweetside | |
| MACHINE TOOLS AID IN PRODUCTION OF "LUCKIES"..... | 54 |
| METHODS ENGINEERING PROCEDURE: INCENTIVES IN THE TOOLROOM..... | 56 |
| By H. B. Maynard | |
| REDUCING COSTS ON PUNCH PRESS TOOLS..... | 72 |
| By Charles G. Thoma | |
| "IDEAS FROM READERS" | |
| —Welding Torch Guide, By S. R. Morris..... | 88 |
| —Welded "Safety" Ladder, By J. H. Hale..... | 90 |
| —Guide Block for Milling Machine, By Roger C. Dickey.... | 96 |
| —"Safety" Holder for Turret Tools, By John A. Honegger.... | 98 |
| "OVER THE EDITOR'S DESK"..... | 102 |
| NEW SHOP EQUIPMENT..... | 104 |
| "THERE'S ONE IN EVERY SHOP", By Wesser..... | 180 |
| INDEX TO ADVERTISEMENTS..... | 182 |

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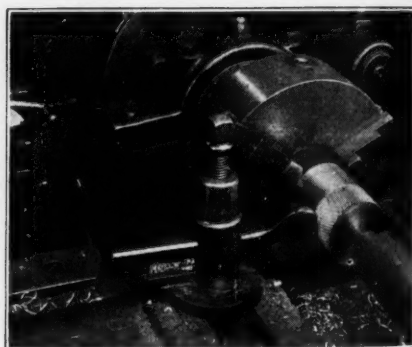
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Fig. 1—Machine Shop tooling at News Shop and Dr. Company's at Newport, Va.

MODERN Machine Shop

CINCINNATI, OHIO

VOL. 8, No. 11

APRIL, 1936

Machine Operations in a Shipbuilding Plant

BY HOWARD CAMPBELL

IN the well-equipped shipyard, the processing of units for new vessels and the reconditioning of parts for boats in for repairs are "all in the day's work." Many of the manufacturing operations are standardized and some of them may be classed as repetitive, but the building of a ship is such a vast enterprise and the operations are necessarily of such a wide and varied range that standardization not only

is impossible but the ingenuity of the supervisors is often taxed to devise various ways and means to get the work out. Particularly in the machine shops, where thousands of items of every size, shape and required degree of accuracy are machined for each ship built, the above holds true. Shipyard shops at best can only be



Fig. 1—Main Machine Shop Building at Newport News Shipbuilding and Dry Dock Company's Yards at Newport News, Va.

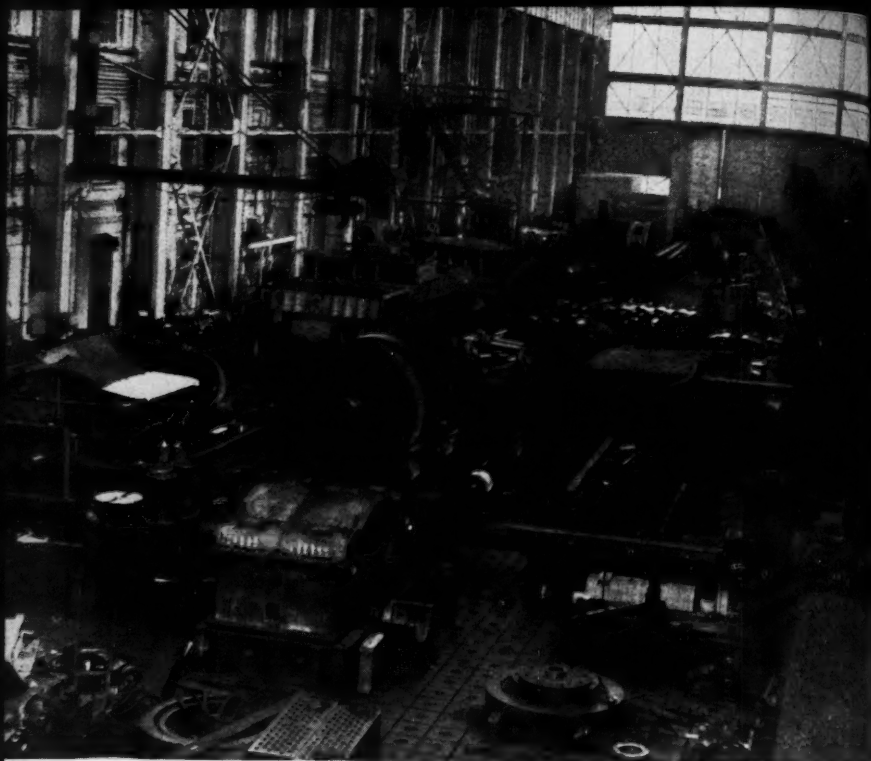


Fig. 2—One End of the Turret and Turbine Shop. Practically every piece of work on this floor is to be used in a steel ocean-going vessel.

considered huge job shops, and special purpose machines are entirely out of the question. At the plant of the Newport News Shipbuilding and Dry Dock Co., Newport News, Virginia, this situation results in many interesting set-ups, some of which are presented here.

To give the reader an idea of the general appearance of the machine shop, a view of the main machine shop building is shown in Fig. 1. The near end of the shop is mostly erecting floor, but the far end is occupied by long shafting lathes, huge vertical boring mills, horizontal boring machines, two big planers, and many other smaller machine tools. The galleries which can be seen on both sides of the shop are given over to brass work, which is so important a part of the work here that 200 men are

employed in the brass machine shop alone. One side of the galleries is devoted to building valves of all sizes and kinds and to the manufacture of turbine blades.

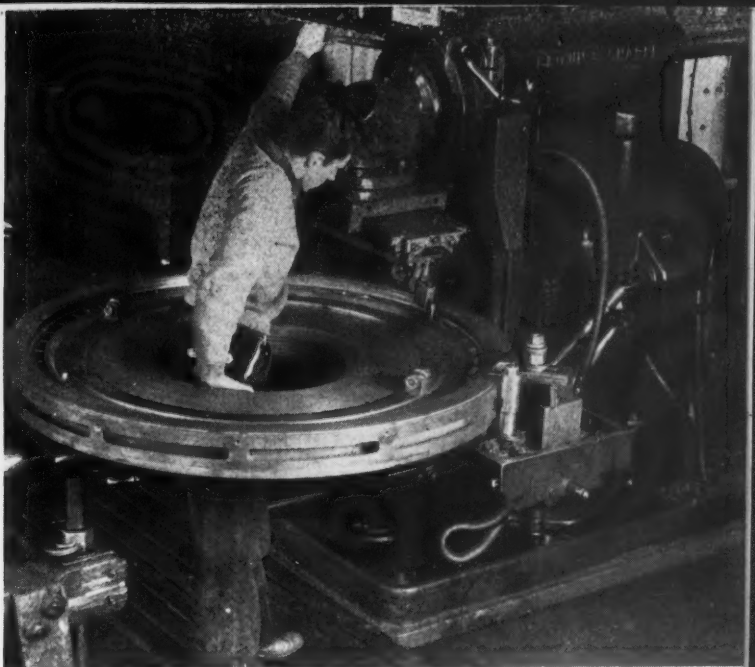
In Fig. 2 is shown one end of the turret and turbine shop. In the immediate foreground at the right is the roof of the tool crib. The varied assortment of reduction gear housings, gears, reduction gear pinions, and turbine rotors shown in this illustration will give a fair idea of the type of work passing through this shop. In the middle distance is a ruler in which a keyway is being cut, and farther along is a large canvas structure that has been erected to maintain a constant temperature while large structural rings are in process of welding.

One of the routine manufacturing

Fig. 3—Steam turbine diaphragm for marine use. This Brown & Sharpe equipped plotting instrument, since its operation which is difficult by other methods.

jobs — of machine a diaphragm for a turbine engine shown machine is machine attach to shape The di very e finishe to op which as sho unusua The rectan in. x 3 to the signed narily has to cordin ial of The t 27 str spindle The r creases cutting. An

Fig. 3—Slotting diaphragms for steam turbines for marine use. This Brown & Sharpe miller, equipped with a slotting attachment, simplifies an operation which is difficult by any other means.



jobs — that of machining a diaphragm for a steam turbine engine — is

shown in process in Fig. 3. The machine is a Brown & Sharpe milling machine, fitted with a special slotting attachment which makes it possible to shape or slot at any angle required. The dimensions of the apertures are very exact, therefore they must be finished. With a small space in which to operate the tool, and surfaces which must be machined on an angle, as shown in Fig. 4, the job is quite unusual.

The apertures in most cases are rectangular and vary in size from $\frac{3}{4}$ in. x $\frac{1}{2}$ in. to 4 in. x $\frac{1}{2}$ in. according to the stage or expansion they are designed for. The cutting speed ordinarily is about 30 ft. per minute but has to be increased or decreased according to the hardness of the material of which the diaphragms are made. The tool reciprocates at a speed of 27 strokes per minute at the lowest spindle speed of the milling machine. The number of strokes can be increased to the highest speed that the cutting tool will stand.

An unusual set-up for cutting key-

ways in a large ship's rudder is shown in Figs. 5 and 6. Made of steel for a steel ship, the rudder weighs 25 tons. There are three keyways to be cut, each $1\frac{1}{2}$ in. deep and 5 in. wide. The hole for the rudder shaft is bored taper, necessitating changing the setting of the job for each keyway. As shown in the illustration, a large open-side planer is used for the job, with the tool,



Fig. 4—Close View of B & S Miller with Slotting Attachment.



Fig. 5—Set-up for cutting three keyways in the tapered bore of a steel rudder weighing tons. The work is positioned on the floor and the tool is mounted on the table of an open-side planer.

which consists of a heavy bar, mounted on the table of the machine. The rudder is blocked up on the shop floor.

The tool-holding rig was built up from a spare portable feeding mechanism used with one of the large boring mills, and the cut is taken by reciprocating the planer table. As the tool backs out of the hole after each cut, the operator feeds the tool forward in the bar, repeating this movement until the keyway is finished to the required depth of 1 39/64 inches. This job is a good example of the ingenious methods that have to be devised in order to get the work out and get it out accurately.

The illustrations Figs. 7, 8 and show the operation of "scarfing" the edges of a section of deck plate for a steel ship. "Scarfig", which is a new term to many production men, consists of planing down the edge of the plate so that when lapped with the scarfed edge of a similar plate as shown in the drawing Fig. 9, the joint will be flat and smooth.

The machine used for this operation is a Sellers open-side planer with a column which can be attached to the open side as shown in Fig. 10. The machine is 120 inches between the housings, is 96 inches under the rail when the rail is at its highest position, and has a 30-foot stroke.

Power is supplied by a 500 h.p. motor, and the machine has a modern

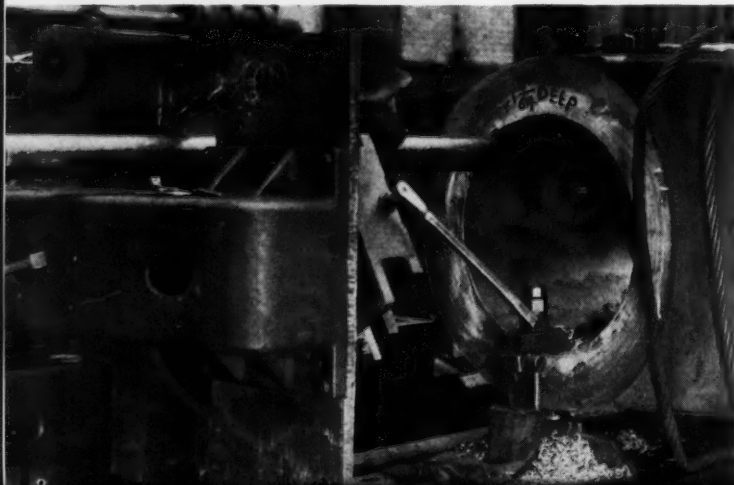


Fig. 6—Close-up View of Tool-holding Rig in Operation, Cutting Keyway in Steel Rudder.

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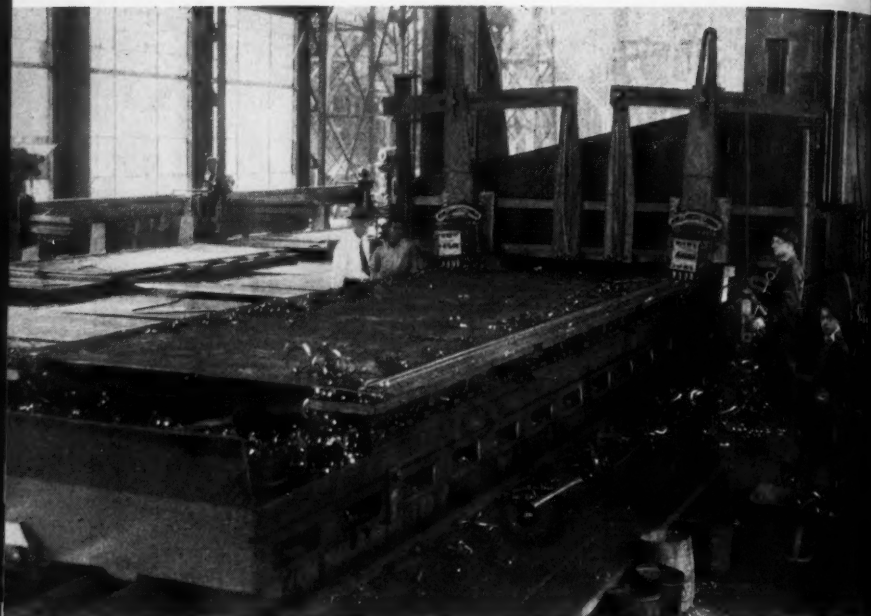


Fig. 7—Scarfig the Edges of a Section of Deck Plate. Note the Taper Attachment, which guides the tools at the correct angle.

controls with which the Sellers planers are equipped.

Both edges of the plate are scarfed at the same time, using two heads with four tools in a head. On the roughing cuts, these tools take $\frac{1}{2}$ inch depth of cut with $\frac{1}{8}$ inch feed while operating at a cutting speed of 30 feet

per minute. Figure 8 shows the head with one tool each, which is the

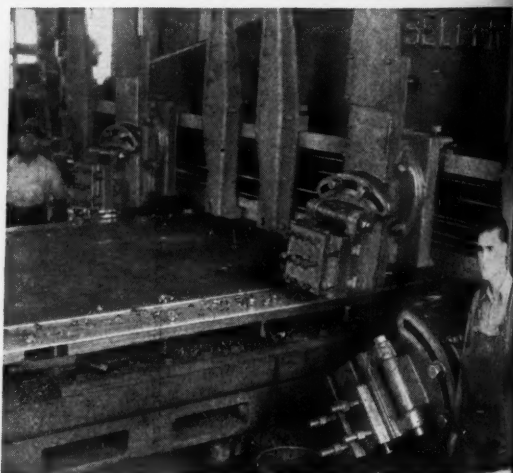


Fig. 8—The size of the machine and work can easily be estimated from this photograph. The machine is equipped with all the latest types of electrical controls.

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when the edges of the plate are being trimmed to size.

The interesting feature of this job is the special rig used to feed the tools at the required angle to obtain the taper indicated in the drawing Fig. 9. The rig operates on the same principle as the taper attachment on a lathe, the tool head being attached to an arm which is pinned to a slide

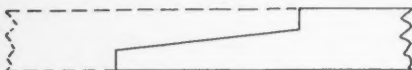


Fig. 9—Drawing illustrating method of scarfing edge of deck plate for joint.

in a guide that can be set at any desired angle to produce the taper desired. One of these taper rigs is supplied for each head, as shown.

Because of its size, power, and open-side feature, this planer is a very important part of the machine shop equipment in this plant. Although equipped with side heads, as shown in Fig. 8, the heads are not used on the scarfing operations.

(This article will be concluded in the May issue.)

CERROMATRIX. A method of locating punches in relation to dies without machining non-working surfaces to close dimensions is described in this booklet. It shows how, by the use of matrix metal, dies and punches can be located for long as well as short runs, without the use of complicated holding devices, and with a substantial saving over the usual cost of dies. Copy of the book free upon application to Cerro de Pasco Copper Corporation, 44 Wall St., New York, N. Y.

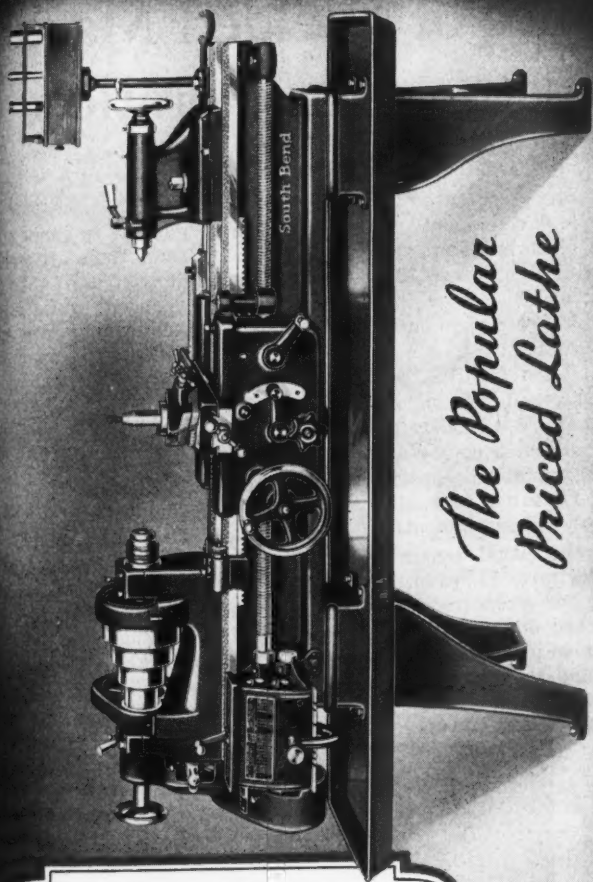
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Sidney St., Cambridge, Mass., can be had by addressing a request to the company.

DRIVER POWER TOOLS, 1936 Motor ELS. Catalog G 6, now being issued by Walker-Turner Company, Inc., Dept. MM2, Plainfield, N. J., contains complete descriptions and illustrations of the "Series 500" and "Series 900" line of metal-working and wood-working tools which comprise the product of this firm. The line includes practically every type of tool needed for the ordinary processing of metal or wood, including the tools, pulleys, flexible shafts, motor belting, and other equipment intended for use with these machines. Copy free upon request.

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No. 350 HYGRADE WORM GEAR SPEED REDUCER CATALOG. The first 19 pages of this 86-page pocket size book are devoted entirely to the evolution of worm gearing and other "customer's problems" dealing with the efficiency, selection, design, speeds, tooth forms, and other factors involved in the use of worm gear speed reducers. The book includes a section devoted to engineering data for selection of worm gear reducers of proper capacity and gives tables of ratios and input ratings, ratio and torque tables, specifications of different types of worm gear speed reducers, instructions on lubrication and methods of application, and also includes more than 20 photographs of different kinds and types of worm gear speed reducer applications. Copy free upon application to Foote Bros. Gear Machine Co., 5315 S. Western Blvd., Chicago, Ill.



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Resistance of Welded Machine Structures to Vibration

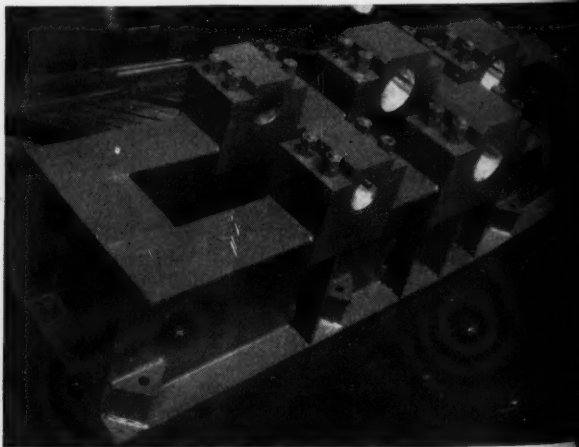
BY ROBERT TWEETSID

AMONG all the developments that have taken place in recent years in the metal working equipment field, probably nothing has had more influence on machine design and manufacture than the welding process. Weldings, the general term for the fabricated product obtained by welding mild rolled steel, afford a modern, efficient and economical method of manufacturing such large units as bedplates, bases, housings, frames, and other parts of machines and equipment.

Provided that the usual tenets of sound engineering are followed, an immense variety of economical designs can be worked out as weldings, free from the limitations of patterns, cores or moulds and sections that are invariably inherent with the use of castings. Welding comprises a remarkably flexible method of fabrication, due to the fact that rolled steel plates or

slabs can be gas-cut to shape, formed if necessary, and then arc-welded to form the complete unit. Weight is considerably reduced, while strength, rigidity, and endurance are greatly increased. Incidentally, manufacturing time is frequently reduced over the amount of time required by other methods of production.

Among other advantages, rolled steel possesses uniformity of structure and freedom from internal stresses; its characteristics are consistent and its structural performance can accurately be forecast. It can be welded without metallurgical damage; it withstands a considerable amount of abuse without fracture, and any deformation that may be produced is capable of correction without undue



Welded steel base for manipulator drive on a gag press used to straighten structural steels that have been allowed to cool after rolling. Fabricated by and used in plant of Bethlehem Steel Company.

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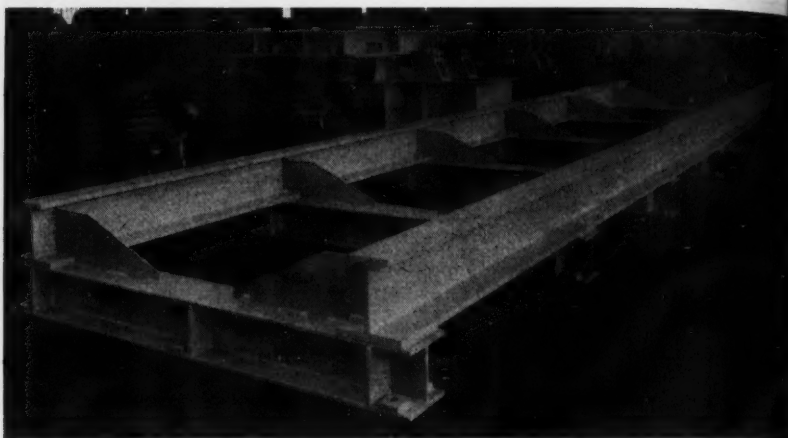
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Welded cross-girder part for manipulator table of gag press having capacity to bend the heaviest beam rolled. Fabricated by and used in plant of Bethlehem Steel Company.

difficulty. Even after completion, it can be altered by welding on additional sections, cutting, or rewelding.

Ordinary cast iron is commonly supposed to be more rigid than steel. This erroneous belief has become prevalent because, being brittle, cast iron in the usual proportions is rarely seen to bend before it breaks. As a matter of fact, under test steel reaches its yield point at about $1\frac{1}{2}$ times the stress required to break a similar section of cast iron. Steel is the most rigid commercial material known. The stiffness of rolled steel; that is, its resistance to deformation by the usual stresses, is on the whole more than twice that of cast iron.

In order to allow a sufficient factor of safety, it is not unusual for the experienced machine designer to add weight to the machine. From the physical properties just enumerated it is evident that properly-designed weldings should be lighter than castings of equivalent strength, because no unduly heavy sections or excess weight to cover unreliability or internal stresses are necessary. Design-

ers and manufacturers accustomed to the relatively heavy proportions of cast iron machine parts should remember this fact in appraising or criticizing the lighter proportions of weldings.

Vibration in machine bases or structures is often accepted as unavoidable because it is, as a general rule, a little understood. Consider the behavior of a rapidly-rotating body such as the common emery wheel. Such a wheel will usually run quietly at its working speed, but will momentarily vibrate violently at some point in its intermediate speed while slowing down to stop. The speed at which this vibration occurs is called the "critical speed", and it is at this point that the amplitude of vibration is at its maximum.

If the working speed of the wheel is too close to this critical speed, the continued vibration may lead to further trouble in the form of looseness in the bearings, play between the working parts, and excessive noise. The peculiar action resulting from operation at the critical speed is

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This is not the place to try out the legal aspects of infringements. That place is in the Federal Courts where we are instituting the necessary infringement proceedings which will be vigorously prosecuted to the limit.

GUARANTEES

Pending the removal of these imitations and infringements from the market by legal action, we suggest that any tool that claims to do everything that the Precision Universal Tool Head will do should carry the same simple unequivocal guarantee that it does. That guarantee is as follows:

"THIS TOOL HEAD MAY BE RETURNED AT ANY TIME WITHIN ONE YEAR FOR FULL AND IMMEDIATE REFUND REGARDLESS OF USAGE."

Insist on this same guarantee. Then let us demonstrate a Precision Universal Tool Head in your own shop and make your decision on performance alone, without depending on statements made by anyone — ourselves or others.

The Precision Universal Tool Head is not just a boring tool. It also faces, recesses, counterbores, mills, undercuts, turns outside diameters and handles a wide range of "headache" jobs that are utterly impossible with any other tool. One compact size handles all diameters from 1/16" to 1 1/2", eliminating the need for various sizes as required in other forms of boring tools.

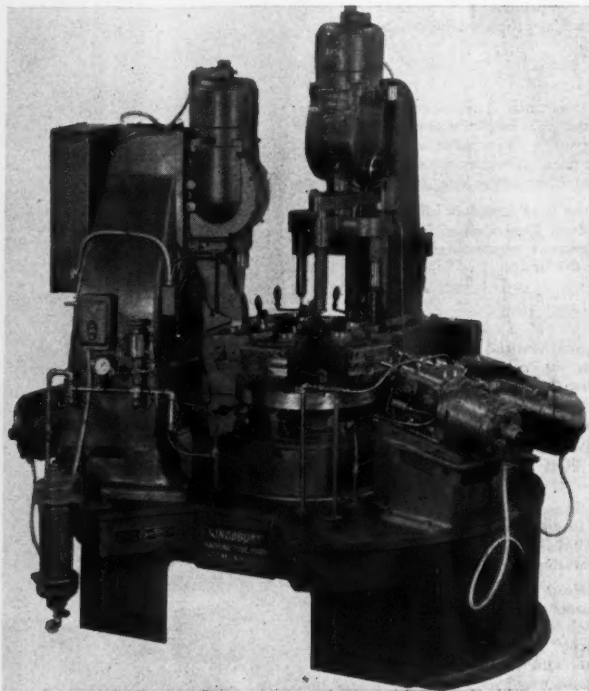
It has been adopted by Pratt & Whitney Co. for their latest model Jig Boring Machines, which are now specially arranged to accommodate this tool and to utilize to the utmost its versatility, speed and accuracy.

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THE PRECISION TOOL COMPANY, Bridgeport, Conn.

to synchronism between the time period or speed of the wheel and the natural period of vibration of the supporting shaft or structure. At this speed a slight amount of unbalance causes a marked vibration, though the unbalance is not enough to produce any appreciable effect at lower or higher speeds.



Kingsbury Drilling Machine. The machine is built on a welded steel main base fabricated by Lukenweld, Inc., Coatesville, Pa., using a special analysis of welding quality steel.

Turning now to stationary or non-rotating parts; every spring, beam, frame, or other elastic structure, when given a suitable impulse, will oscillate with regular beats the time of which is constant for each case or independent of the amplitude of the swing like the pendulum of a clock.

The time for a complete oscillation is termed its natural period of vibration, and depends upon the elastic properties of the object under consideration, its mass, and the magnitude and location of any loads.

High frequency vibration such as that produced by high speed electric motors or fans is readily transmitted

to members of rigid structures. Sometimes it reappears at a distant point where the natural frequency of some member of the structure is such that the frequencies of the two parts synchronize.

Reciprocating machines usually have strong inertia forces which cannot be fully neutralized in the design. They are therefore subject to vibrations of much greater amplitude than rotary machines, although in general of lower frequency. In stationary machines the usual remedy is to employ a base or foundation of sufficient mass to reduce the frequency of vibration to a figure not likely to be met at the usual running

speeds. This use of weight to absorb vibration is called "inertia damping". Increasing the stiffness raises the frequency to a value that is not likely to synchronize with any other part near enough to be influenced.

An important point in favor of the use of weldings for such structures

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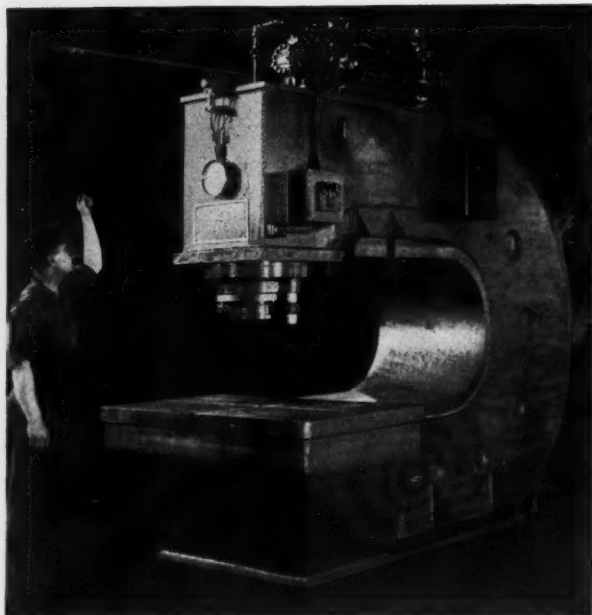
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Denison 100-Ton Self-Contained Hydraulic Straightening Press equipped with a welded steel frame designed and built by Lukenweid, Inc., Coatesville, Pa.

is that, by suitably ribbing or stiffening the structure, the vibration can be eliminated without the necessity of sheer dead weight. This fact is particularly noticeable to the observer who will compare any of the old-style cast iron bedplates or machine frames with the modern equivalent in weldings.

Until the introduction of flame-cutting, the only methods of cutting steel were shearing, sawing, or machining. When reasonably good edges were required, shearing was limited to plates not much over 1 in. in thickness, and planing was comparatively expensive. The development of flame-cutting and welding makes possible the production of a great variety of machine parts from plates, slabs, and structural steel sections, and because of the ease of welding ordinary cast steel or low carbon steel, steel castings may be easily incorporated

where advantageous.

The box section which may be difficult to obtain in castings becomes quite feasible in frames of welded design. It has excellent resistance to torsional stresses as well as to stresses of tension or compression. As rigidity is most essential in machine bases and the stresses involved

are often complex and difficult to analyze, the box section provides the required resistance to deflection with a minimum of weight.

ALLIGATOR FILE CATALOG No. 4. The complete line of American or Commercial Pattern Files and Swiss Pattern Files made by Carson-Newton Company, 21-23 Prospect St., Newark, N. J., are illustrated and described in a 32-page book which is available upon request to this firm.

SHEET METAL WORKING EQUIPMENT. Manufacturers of products made from sheet metal will be interested in the data contained in this folder, which is now being issued by Maplewood Machinery Co., 2638 Fullerton Ave., Chicago, Ill. The folder contains descriptions of the Model C Chicago Elbow Machine, Chicago Double Lock Pipe Rolling Machine, Cutting and Edging Machine, and Maplewood Gang Punch. Illustrations are also included of the Niagara No. 4 G. Punching and Shearing Machine and the Gray Sheet Metal Cutter. Copy free upon request.



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Partitions keep stock and tools safe. Standardized units insure ease of erection and low first cost.



Sani-Robe Coat and Hat Rack. Sanitary—Convenient—Economical.

... **T**HE most practical means of protecting supplies and equipment, guarding machinery, etc., building enclosures and partitions and solving many similar problems in every shop. Acorn wire mesh products are easy to install and to move . . are sanitary and attractive . . are fully fireproof and are amazingly low in cost.

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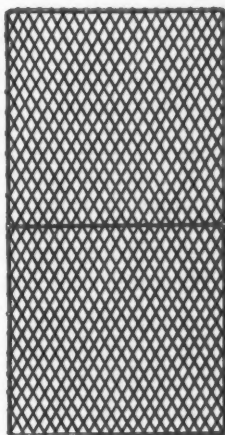
ENCLOSURES —
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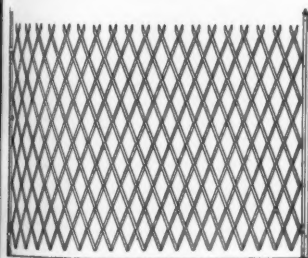
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"ROCKWELL" HARDNESS TESTER

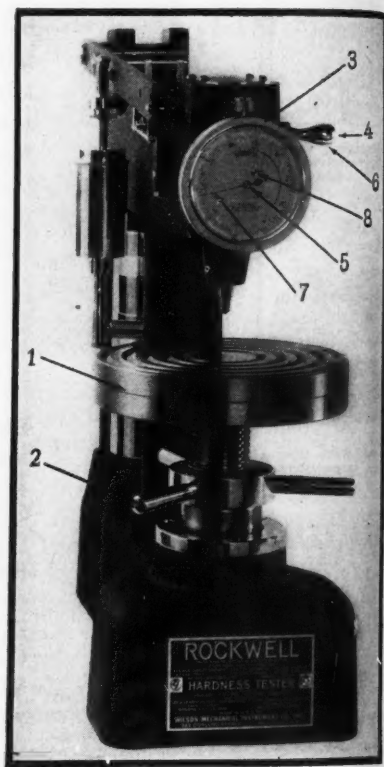
Only One Dial to Watch

Easy to operate—See below.

Easy to check—See opposite.

1. Place piece to be tested upon anvil or testing table.
2. Turn wheel to elevate work into contact with test point and continue turning and forcing work against penetrator till index 8 shows that Minor Load is applied.
3. Turn bezel of gauge to set dial behind pointer.
4. Push handle back an inch to release and apply Major Load.
5. Observe when moving pointer comes to rest, then—
6. Pull handle forward, thereby removing the Major but not the Minor Load.
7. Read "ROCKWELL" HARDNESS Number on the dial.

It takes just about as long to make a "ROCKWELL" Hardness Test as you normally take to walk 15 or 20 feet.



Anyone clever enough to make normal use of a screw driver or an alarm clock can learn to use the "ROCKWELL" accurately in 20 minutes.

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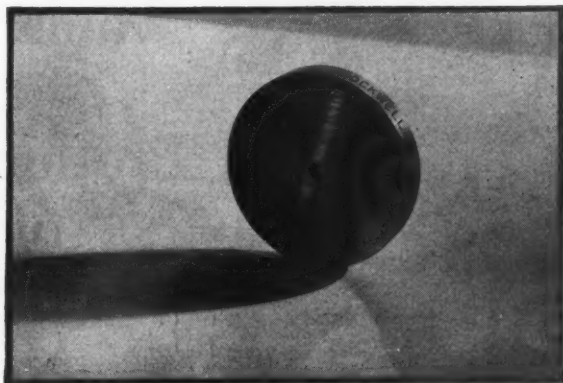
MECHANICAL INSTRUMENT CO. INC.

Concord Ave. & 143rd St.
New York, N. Y.

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"ROCKWELL" TEST BLOCKS



"C" Scale Test Block — 2" Diameter

If we could make a "ROCKWELL" Hardness Tester in form as simple as a "ROCKWELL" Test Block that is the way we would make it. We cannot do that and so we build you a machine which has, and must have, many parts. Its parts can get worn, broken, dirty or be put out of adjustment, just as any sort of machine can; and a measuring machine, especially one measuring micrometric values, is in one important way very different from a machine to do work. A measuring machine loses not some but all merit when not in fine condition.

While it is impossible to give you a simple thing with which to measure hardness of your product, we can give you the simplicity of a carefully made test block to check your "ROCKWELL" Tester. Don't be careless, or a gambler in your hardness testing, when there are ways provided for precision testing. Test blocks are cheap, — and cheaper still when ordered three or more at a time. The operation of the

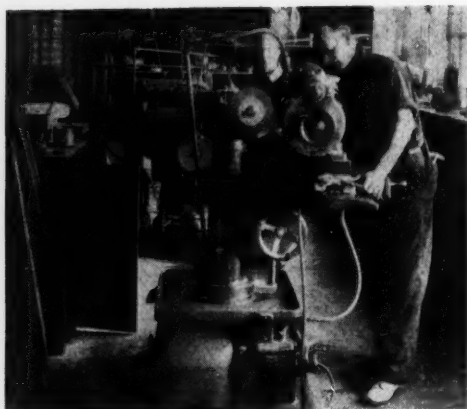
"ROCKWELL" is so simple that it is often entrusted to those who have had so little experience in measurement that they do not realize the need for checking. Someone should assume or be assigned that responsibility in each plant. We make the "ROCKWELL" with care and precision. We see that it reaches you in good order. After that the responsibility to ascertain that the machine is always in shape for precision testing rests with you, and the test block puts the accuracy of our standardizing laboratory at your service.

Remember that if the gauge or penetrator or some other part of your machine is in bad order you are not making a genuine "ROCKWELL" Test.

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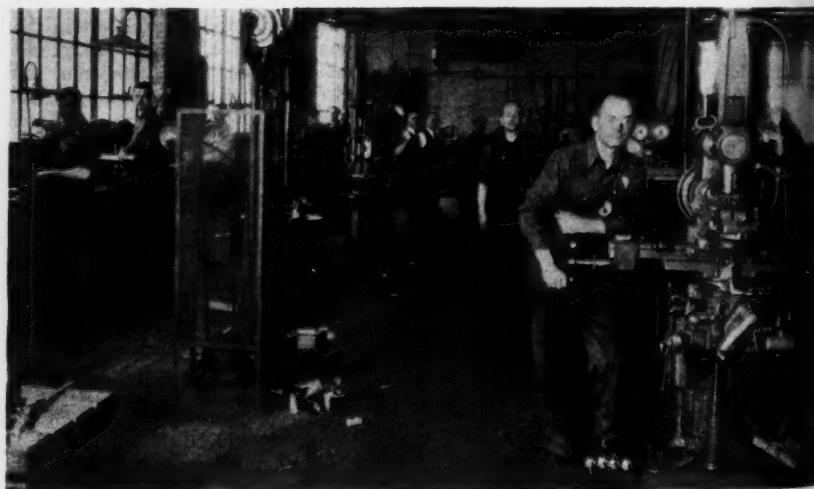


Machine Tools Aid in Production of “Luckies”



THE pictures presented on these pages are views of the machine shop in the “Lucky Strike” factory of the American Tobacco Company at Richmond, Virginia. To maintain the present production of 80,000,000 cigarettes a day, every machine in the plant must be kept in first-class running order—a task that is only possible with the aid of the “Master Tools of Industry.”

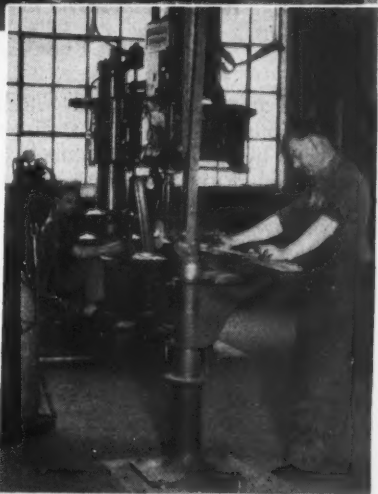
Above, at the left, are two of the grinding machines in the cutter main-





tenance department, and below is a general view of one side of the shop showing the benches, several milling machines, drill presses, and other tools. Illustrated on this page are the welding and heat treating department, a big radial drill, and a line of lathes, shapers, and other machines.

Here again machine tools provide for the employment of thousands of people and make it possible to obtain high grade tobacco in the popular form at a fraction of the price which would be necessary if cigarettes were made by the antiquated hand process.



Methods Engineering Procedure: Incentives in the Toolroom

BY H. B. MAYNARD,
President, Methods Engineering Council, Inc., Pittsburgh, Pa.

*In this—the sixth article of the series—the author explains
how incentives are adapted to non-repetitive
work at the Westinghouse plant*

IT is quite generally recognized that motion and time study and incentive plans of wage payment can be applied with benefit to the employer, the employee, and the consumer on work of a repetitive nature. On non-repetitive work, however, the application is not so simple, and because of the obvious difficulties which present themselves, there is a feeling that no matter how great the need may be, incentives based upon accurately-established time allowances are impossible of attainment.

It is the purpose of this article to demonstrate that incentives on non-repetitive work are practicable by discussing an application to a class of work which is generally considered to be the most difficult to measure, and that is toolmaking. The plan to be described is in effect at the present time in the East Pittsburgh Works of the Westinghouse Electric & Manufacturing Company. The plan is the result of many years of steady development.

Brief History of Development

About 15 years ago, the management, recognizing the stimulus to ef-

fort that incentives give and the gratifying cost reductions which invariably follow a properly set-up installation, decided to apply their regular incentive plan of wage payment to the more repetitive work in their toolroom. Certain standard items such as screws, bushings, and locating pins were made for stock in fairly large quantities, and it was evident that the time required to make them could be accurately measured and that time values could be established.

Accordingly, this class of work was put on an incentive basis. Effort was stimulated, production rose, costs fell, and the earnings of the workers increased. Because of the comparatively simple nature of the work, the hourly rates of the men doing it were lower than the rates of the toolmakers engaged upon more exacting work. Under the incentive plan, however, the men on the simpler work were able by exerting good effort to earn as much as or more than the more skilled toolmakers who were paid a straight hourly rate. Hence the desire for the opportunity to increase earnings in the same manner was presently expressed by the tool-

**The New 1-B, $\frac{1}{4}$ " Capacity ($\frac{5}{16}$ " Chuck)
2-B, $\frac{3}{8}$ " Capacity ($\frac{1}{2}$ " Chuck)**

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making force in general, regardless of the type of work they were doing.

In consequence, the Time Study Department was requested to make studies for the purpose of extending the application of incentives to the non-repetitive work. The first toolmakers engaged in producing jigs and fixtures were turned over from day work to the Westinghouse standard time plan of wage payment in 1924, not, it must be confessed, without certain misgivings on the part of a good many interested observers. There were some who doubted the possibility of establishing accurate time allowances on such a varied line of work in a reasonable time and for a reasonable cost, and there were others who were apprehensive of the effect which the new plan would have upon the accuracy of the tools produced. The latter group feared that quality would be sacrificed for quantity and that the acquisitiveness of the individual would lead to the production of poor work.

What happened was almost the opposite of what was feared. The Time Study Department set up a system, since revised and improved, which, together with standard data and formulas, enabled them to establish reasonably accurate allowances in advance of the performance of the work. Quality not only was not decreased, but was maintained to an extent which for a while seriously threatened the success of the installation.

Toolmakers are, of course, skilled craftsmen, and they take a very real pride in turning out good work. This feeling was unchanged after the introduction of incentives and whenever there was a choice between turning out good work or earning a bonus, the bonus was unhesitatingly sacrificed. Therein lay the difficulty. The Time Study Engineers in analyzing the work would often discover short

cuts which would cheapen the job without detracting from its effectiveness. Many jigs, for example, require a smooth flat surface on the bottom and the accurate placement of bushings, locating pins, and so on, but the finish of the balance of the jig is unimportant. The sides of a simple box drill jig play no part in the functioning of the jig, and can well be left unfinished. The Time Study Engineers on a job of this kind would allow no time for machining the outer surfaces of the jig sides.

This practice, of course, led to the production of jigs of an inferior appearance, although their effectiveness was in no way impaired. The poor appearance was against all traditions of good tool making practice. When many of the toolmakers found that they were not going to be allowed time for putting the customary finish on their work, they simply gave up the idea of earning a bonus and proceeded to work as they always had. In order to overcome this attitude and to bring the tool makers to the point where they were at least meeting the allowed time, a long, slow period of reeducation was required. It has now been accomplished more or less completely and bonus is earned regularly. Quality is still the factor of greatest importance to the toolmaker, but he now thinks largely in terms of necessary quantity.

Establishing Time Allowances

All time allowances are established by the Time Study Department before the job is put in work, with the exception of a few unusual operations upon which no data is available and which must therefore be time-studied. The system under which this is done is the result of considerable development, and it is felt that it operates as nearly perfectly as any plan can under existing conditions.

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Starrett



MOLYBDENUM HACKSAW

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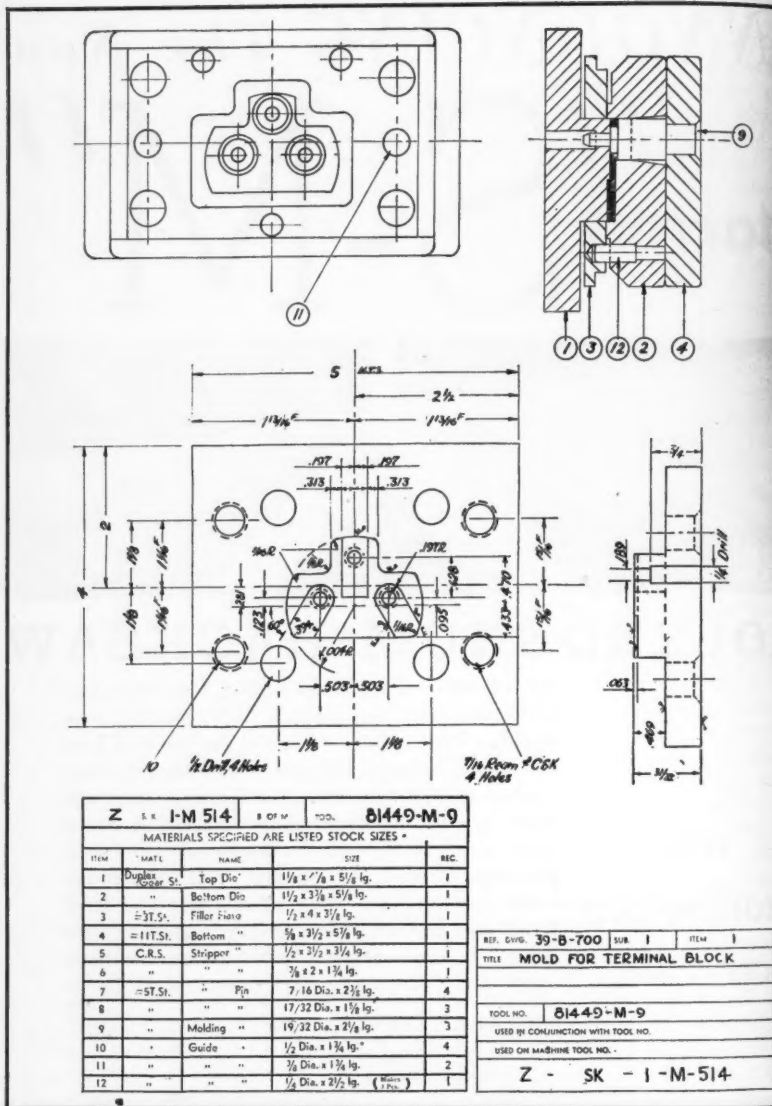
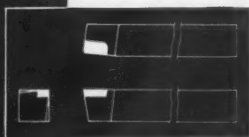
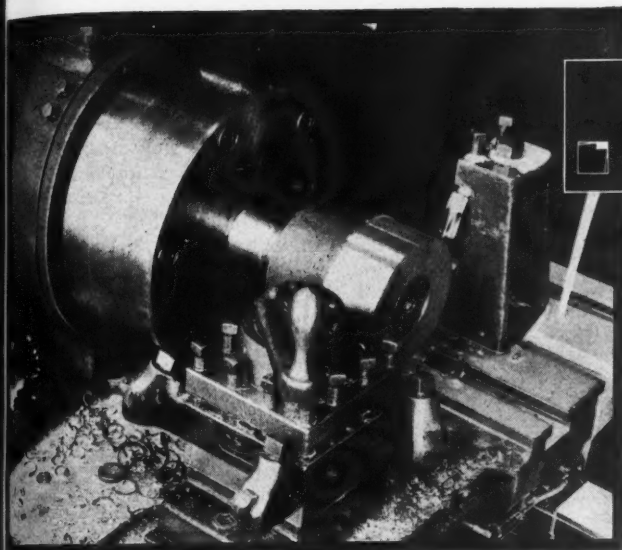


Fig. 1—Section of Tool Drawing and Bill of Material.

When a tool is to be made, detail drawings are first prepared by the tool designers. Fig. 1 shows a portion

of one of the drawings. As soon as the drawing is completed it is turned over to the time study man



Tool used in this operation. One inch square, Vascoloy-Ramet Grade C, for general purpose machining on carbon and alloy steel forgings up to 400 Brinell. Tip, $5/16'' \times 3/4'' \times 3/4''$. Side rake, 6° . Front clearance, 6° . Back rake, zero. End clearance, 8° . Nose radius, $1/16''$.

Cutting gear blank five inches in diameter. MATERIAL: Forged nickel steel, SAE 2315. Comparative performance of VASCOLOY-RAMET tool:

| | Feet per minute | R. P. M. | Feed | Depth |
|-------------------|-----------------|----------|-------|--------------|
| VASCOLOY-RAMET | 240 | 180 | .0313 | 1/16 to 1/8" |
| Previous practice | 85 | 64 | .0313 | 1/16 to 1/8" |

Production tripled! Another Vascoloy-Ramet record! Again this new hard alloy, tantalum carbide, demonstrates a superiority evidenced in every field by more pieces per grind, by better work, or by work completed two to five times as fast.

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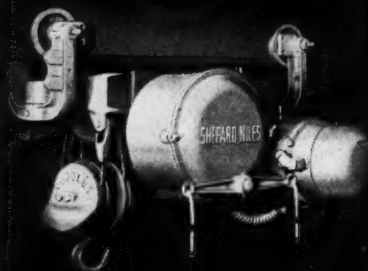
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who immediately checks the bill of material. Often from this knowledge of the materials which are available he can suggest changes or substitutions which effect worthwhile economies. When the material has been checked, the time study man routes the job to the group or groups best equipped to handle it. The toolmakers, incidentally, work for the most part in groups. Each group has all of the machine tools which it needs to turn out a complete tool, with the exception of a few special, precision machines which are too costly and too little used to justify supplying to each group.

When the job has been routed, the drawing is turned over to the Production Department, who orders the material and has it delivered to the group. As soon as the material has been ordered, the drawing is returned to the time study man, and it is his task to establish all time allowances before the material reaches the group. Most toolroom jobs are rush jobs, so it becomes incumbent upon him to do this part of his work as quickly as possible.

The first point which must be considered by the time study man is the method to be followed in making the tool. Because of his training and because of his opportunities for concentrated analysis, the time study man is usually able to devise a method which will take advantage of all practical short cuts. It would not do for him to consider this part of the work finished as soon as he has decided upon the method, however, and to start to establish time values, for there is no assurance that the toolmakers will follow the method he has laid out. There are usually a number of ways in which a job can be done, and most toolmakers, like other craftsmen, have their own way of working. Therefore in order to be

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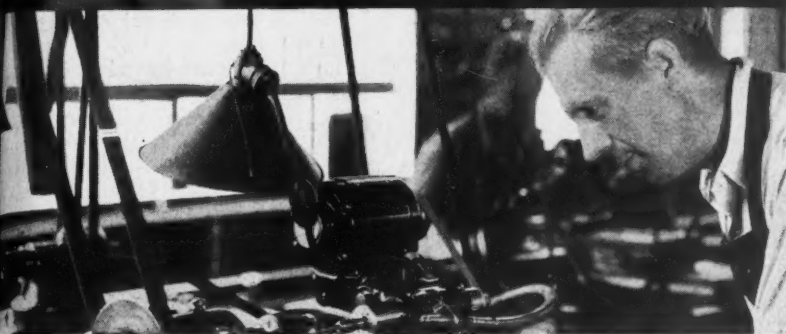
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FOR JACOBS CHUCKS



When it comes to putting precision onto a production basis, "Jacobs" is a big name. That puts punch into the fact that the Jacobs plant makes extensive use of Dumore Precision Grinders, both on production and in the tool room. Grinding the bite on Jacobs chuck jaws—intermittent cut at 40,000 r.p.m.—the Dumore No. 5 Grinder licked a bad maintenance problem, improved accuracy, and stepped up production.

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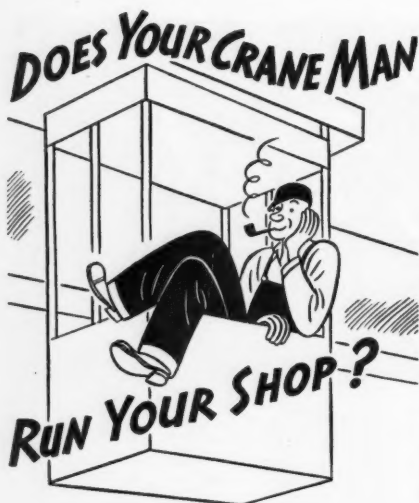
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MEET the lordly crane man upon whom all hands wait as he makes his rounds—gives workmen a “lift” with heavy pieces from floor to machine tools. He’s an autocrat in the machine shop that’s not equipped with Zip-Lifts for fast “spot handling.” Why not get away from such horse-and-buggy methods of production? Ask us about this newest idea in hoisting equipment that’ll pay for itself out of savings.



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**STOPS WASTE
WITH “SPOT HANDLING”**

sure that the method upon which the time allowances are established and the method which the toolmaker uses are the same, it is necessary for the time study man to issue certain instructions to the group leader.

This is accomplished by providing the time study man with a dictaphone. As he works out the method which is to be used, he dictates an instruction sheet. At the same time he establishes time allowances, by methods which will be described presently, so that all of his work in connection with the job is done at one time. A stenographer transcribes the instructions, and the instruction sheets are sent by her to the interested supervisors. One copy goes to each of the manufacturing foremen who will supervise the job, one copy goes to the Tool Supervisor, one to the heat treating foreman, one to the group leader, and one is retained for the Time Study Department's files. In this way, everyone connected with the job works to the same method and thus confusion, inefficiencies, and duplications are avoided.

The instruction sheet as written up for the job indicated by the drawing Fig. 1 is as follows:

TOOL No. 81449—M—9
Serial 8730

Centerpiece Mold for Terminal Slet
—Type MX

Supervisory Group 11.

Item No. 1—Duplex Gear Steel

Shape complete, including steps—Allow minimum of 0.010 and maximum of 0.015 on 31/32 dimension and also on steps for grinding.

Anneal in W-53.

Grind decimal dimensions before milling.

Layout top form for milling machine and mill grooves 0.063 deep first.

Then place on index and mill all radii.

Bore and drill holes on Jig Borer.

File and polish twice, before and after heat treating.

Item No. 2.

Shape complete, allow grind on dec

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SMALL END-MILL
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One Man Job—56
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SYRACUSE BLDG., SYRACUSE, N. Y.

mal dimension only 1.250—Allow minimum of 0.010 and maximum of 0.015.

Finish shape steps at 45 degree angle also, and depth 0.375.—Allow 0.010 on this dimension for cleaning purposes before milling.

Anneal in W-53.

Grind to finish decimal dimensions, layout inside form and mill straight side first, then place on index using same set-up as was used for Item No. 1—and mill radii to meet straight surfaces.

Drill and bore on Jig Borer.

Bench operator to ream three tapered holes.

File and polish before and after heat treating—Gr. No. 11.

Item No. 3.

Shape complete—No Grind.

Layout and drill three (3) holes for slotter and slot form complete.

File after slotting and polish—Gr. No. 11.

Items No. 7, 8, 9, 10, 11 and 12.

Turn complete—Do not leave material for grinding on any of these items—Gr. No. 13.

Fit and assemble 5 and 7, 6 and 8—Gr. No. 11.

Do these together so as to save time on bench operation.

Item No. 4.

Shape, grind, layout, drill, bore—Gr. No. 11.

File, polish and assemble mold complete—Gr. No. 11.

Do not forget to see Mr. Hentschel on Item No. 1 and No. 2 before and after heat treating.

As was previously stated, time allowances are established by formulas, but it is impracticable to use formulas which are as detailed as those used for repetitive work because of the time which would be required to work them through. Therefore various combinations and groupings are made and values for quickly determined conditions are set up as average lumped values. The form in which the data is arranged is shown by Fig. 2. This method is admittedly not as accurate as regards the detailed values as if more detailed formulas were used, but a number of detailed operations are always performed by the same group and checks have shown that the final time al-

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Surfacer

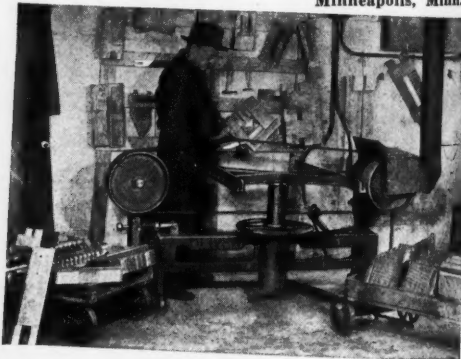
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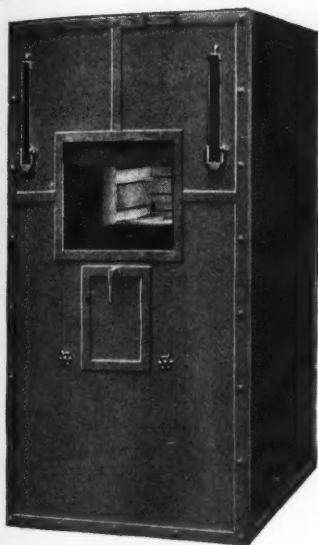


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| Operation Fit | Very Simple .02 | Simple .40 | Average .75 | Complicated 1.25 | Very Complicated 1.50 |
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|------------------|-----------------------|---------------|----------------|---------------------|-----------------------------|

(2)

| Lid Radius | | Radius on Pin End |
|--|--|-------------------|
| Up to $\frac{1}{16}$ " thick x 1" long | | .150 hours |
| Over $\frac{1}{16}$ " " x 1" " | | .200 " |
| Up to $\frac{1}{8}$ " " x 1" " | | .200 " |
| Over $\frac{1}{8}$ " " x 1" " | | .250 " |
| Up to $\frac{1}{4}$ " " x 2" " | | .310 " |
| Over $\frac{1}{4}$ " " x 2" " | | .340 " |
| Up to $\frac{3}{8}$ " " x 3" " | | .360 " |
| Over $\frac{3}{8}$ " " x 3" " | | .380 " |
| Up to $\frac{1}{2}$ " " x 4" " | | .400 " |
| Over $\frac{1}{2}$ " " x 4" " | | .420 " |

For each add. 1" over 4" add 10%.
 $\frac{3}{4}$ " and under by fitter.

(3)

L. O. CLAMP SLOTS AND ELONGATED HOLES

| | |
|------------|------|
| 1st Slot | .110 |
| Add. Slots | .060 |

(4)

CLAMPING SLOTS AND ELONGATED HOLE IN MATERIAL UP TO AND INCLUDING $\frac{3}{4}$ " THICK TO BE MADE BY FITTER.

Note:—Conditions shown below.

| | $\frac{1}{16}$ " long | | $\frac{1}{8}$ " long | | $\frac{1}{4}$ " long | | $\frac{3}{8}$ " long | | $\frac{1}{2}$ " long | | $\frac{3}{4}$ " long | |
|----------------------|-----------------------|---------|----------------------|---------|----------------------|---------|----------------------|---------|----------------------|---------|----------------------|---------|
| | 1 slot | 2 slots | 1 slot | 2 slots | 1 slot | 2 slots | 1 slot | 2 slots | 1 slot | 2 slots | 1 slot | 2 slots |
| $\frac{1}{16}$ " th. | .400 | .600 | .460 | .690 | .520 | .780 | .580 | .870 | .640 | .970 | .750 | 1.100 |
| $\frac{3}{4}$ " th. | .467 | .700 | .537 | .805 | .610 | .910 | .680 | 1.015 | .750 | 1.120 | | |

For cast iron use values in above columns.

For C.R.S. or Machine Steel add 10%.

For C.S., M.S. Forgings, No. 3, 6, 8, 10 or 11 T.S. add 20%.

For No. 3, 6, 8, 10 or 11 T.S. Forgings add 25%.

For No. 11 T.S. 40 to 46 scler. add 30%.

(5)

(LIDS HAVING BUSHINGS)

| W Width of lid open | | L Length of lid | | T Time allowed | |
|---------------------|------|--------------------|------|--------------------|------|
| | | FIT LIDS PARALLEL | | | |
| WxL | Time | WxL | Time | WxL | Time |
| 2x3 | .600 | 2 $\frac{1}{2}$ x3 | .700 | 3x3 | .900 |
| | | | | 3 $\frac{1}{2}$ x4 | 1.30 |
| | | | | 4x4 | 1.50 |

Fig. 2—Data compiled for establishing time allowances.

lowances are quite accurate, due to inaccuracies balancing one another.

As the time allowances are established, they are written up with indelible pencil on the form shown by Fig. 3. This form is printed in hectograph ink and hence is readily duplicated. Copies are sent to those

concerned with the job in the shop and in the production, cost, and inspection departments.

Administration and Results

The system outlined above has been used for some time and has been functioning satisfactorily. Since so much of the work, particularly in con-



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On the basis of tonnage ground, rate of stock removal and hours of wheel life, Abrasive Company wheels readily prove their merit. Their superior grinding performance is your assurance of lower grinding costs in your cleaning room.

Resin bonded for high-speed equipment and vitrified bonded for low-speed equipment, they meet every condition of use—for large swing frame, floor stand or portable electric and pneumatic grinders—on all types of castings.

Skilled abrasive engineers are available to assist in making recommendations for your conditions of use. An inquiry will bring details and entail no obligation.

ABRASIVE COMPANY
TACONY AND FRALEY STREETS, PHILADELPHIA, PA
DIVISION OF SIMONDS SAW AND STEEL COMPANY



nection with establishing methods, is done in the mind of the time study man, it follows that the effectiveness of the system is proportional to the

original and the repeat order, so that the saving can not be attributed to any familiarity with the job, but only to the benefits which have accrued

| | | | | | | | | | | |
|--|----------------------------------|---|-----------------------|---------------------------------|---------------------|---|----------------|---|--|--|
| TOOL No. 81449-M-9 | | NEW TOOL REQUISITION | | DATE TOOL WANTED 5-25 | | DATE TOOL PROMISED | | Nº 44 | | |
| SUPPLY DEPT. S. R. D. | | ORDER No. Reg. 432430 | | DEL. TO TOOL ROOM Z | | TOOL MADE IN W 5 | | TOOL USED IN Z | | |
| DWS. No. 39-B-700 | | SUB. ITEMS 1 1 | | TOOL SK. No. 1 M 514 | | SUB. | | YEARLY ACTIVITY | | |
| TITLE OF APPARATUS Type "Mx" Instrument Terminal Block | | DESCRIPTION OF TOOL Single Pc. Mold | | TOOL RECORD | | TO BE USED IN CONJUNCTION WITH TOOL No. | | INSPEC. GAUGE YES <input type="checkbox"/> NO <input type="checkbox"/> | | |
| DWS. LIST Advance B.M. attached | | | | | | | | | | |
| SIGNATURE J. C. L. | | TOOL SUPV. | | DATE WRITTEN 5-15 | | DATE TOOL COMPLETED | | | | |
| OPER. | MFG. OPERATION | GROUP OR CHECK No. | MACHINE ROUTE | OPERATION STARTED | OPERATION COMPLETED | EST. COST \$ | | | | |
| 1 | Check & Bore - RUSH JOB | 75 | See Instruction Sheet | Group 2 II | | INSPECTED BY | | | | |
| 2 | Re-1+2-3-5- 75% | 6.15- | | | | DEFECT-IF ANY | | | | |
| 3 | Re-1+2 Form only - Mill | 9.50- | | | - 27.50 - Group II | | REPAIR-REPLACE | | | |
| 4 | Re-1+2-4 - Bore | 11.85- | | | | TOTAL FAC. COST \$ | | | | |
| 5 | Re-2-3+4 Grind 75% | 14.0- | | | | | | | | |
| 6 | Re-1-2-3-4.0 dr & Tap | 8.25- | | | -12.21- Group II | | | | | |
| 7 | Re-3 - Slot | 2.56- | | | | | | | | |
| 8 | Re-1-2-3-4-9-10-11-12 Heat Treat | D.W. | | | W-53 | | | | | |
| See Sheet # 2 | | W. E. & M. CO.-WORKS DEPT. | | | | *FORM 15035-D | | | | |

Fig. 3—Form Used for Recording Established Time Allowance.

ability of the time study man. The time study men engaged on this work have an exceptionally detailed knowledge of toolmaking practices and have keen powers of analysis.

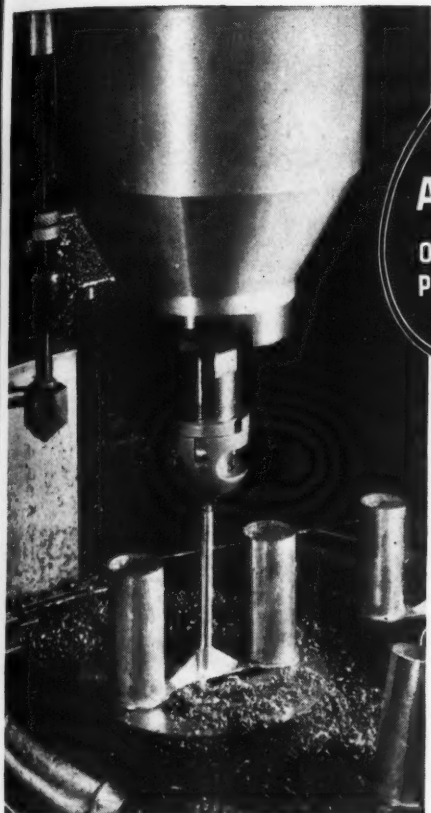
At the present time, five time study men are establishing time allowances for 400 toolmakers. Four do the work which has been described above, and one handles special assignments and collects additional data.

The savings in tool costs since the plan went into effect have been most gratifying. A check has been made of the cost of certain tools which were made on the day work basis and the cost of those same tools when made on a reorder after the incentive plan was established. Considerable time elapsed in each case between the

from the incentive plan. Representative jobs on which comparisons were made show the following.

| Tool Description | Day Work Cost | Std. Time Cost | Reduction in Time per cent |
|---------------------------|---------------|----------------|----------------------------|
| Gauge | 45.25 | 18.50 | 59.0 |
| Gauge | 70.72 | 33.72 | 52.2 |
| Gauge | 17.06 | 11.04 | 35.3 |
| Counterbore | 93.85 | 35.93 | 61.7 |
| Drill Jig | 391.41 | 317.42 | 18.9 |
| Profile Fixture | 215.92 | 117.71 | 45.6 |
| Circ. Form Tool | 25.00 | 16.29 | 34.9 |
| Single Piece Tray | | | |
| Mold | 1869.04 | 965.25 | 48.5 |
| Spinning Pot Mold | 951.41 | 567.38 | 40.1 |
| Terminal Block Mold | 529.94 | 446.11 | 15.9 |

On the ten tools a cost reduction of 39.2 per cent was made. It is reasonable to assume therefore that the cost of all tool work has been reduced by a similar amount since the incentive plan was introduced.



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| | |
|-----------------------------|-----------------------|
| Material..... | Zinc base die casting |
| Size of Thread..... | 1/4"—20 TRIPLE thread |
| Length of Thread..... | 2 3/4" |
| R.P.M. Threading "on"..... | 550 |
| R.P.M. Threading "off"..... | 1100 |
| Production..... | 750 pieces per hour |

15,000 pieces were threaded before it became necessary to resharpen die

THE HASKINS METHOD

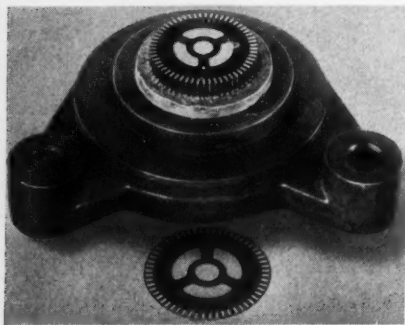


Fig. 1—The extra long punches in this lamination die are supported by matrix, built up around the punches to a point where it will just clear the stripper. Extra punch length is obviously an economy.

THE slow, costly fitting and filing method of locating punches in the punch plate of a metal-working die is unnecessary in most cases. This is conclusively proven by the experience of many large users of blanking, piercing and trimming dies during the past few years.

These progressive manufacturers have brought to a high degree of proficiency a simple procedure in locating and securing punches that shows outstanding savings in time and money. Briefly, the process involves the cutting of oversize locations in the punch plate. The punches are then secured in these locations by filling in the space between each punch and the surrounding edges of the location with an alloy of lead, tin, bismuth and antimony known as "matrix" and marketed by the Cerro de Pasco Copper Corporation under the trade name "Cerromatrix."

The many effective dies in which this method has been used indicate that savings of two to two hundred hours of labor may be expected in a single die. Such economies are, of course, well worth the consideration of die makers, production executives

Reducing Costs on Punch Press Tools

BY CHARLES G. THOMA

and owners of plants in which punch press tools are used.

Advantages of the Matrix Method of Securing Punches

The use of a matrix of the type mentioned makes it unnecessary to use complicated holding devices. It also provides a fast and accurate method of locating punches in relation to dies without the need of machining non-working surfaces to close dimensions. While the savings are especially pronounced in the case of large complicated dies and punches, they are important even in the smaller and simpler dies.

By making complicated dies in easily machined sections and mounting these sections in matrix, not only is there a saving in time but the occasional heavy loss caused by the cracking of a one-piece die in hardening, or in operation after hardening, is avoided.

Figure 2 is a good illustration of a die in which two of the punches are made in sections. It can easily be seen that the loss due to the cracking of one of the thinner sections (where such damage is most likely to occur) would be small compared to

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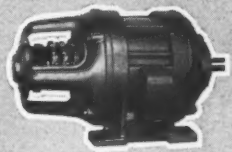
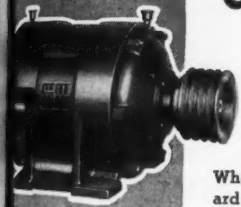
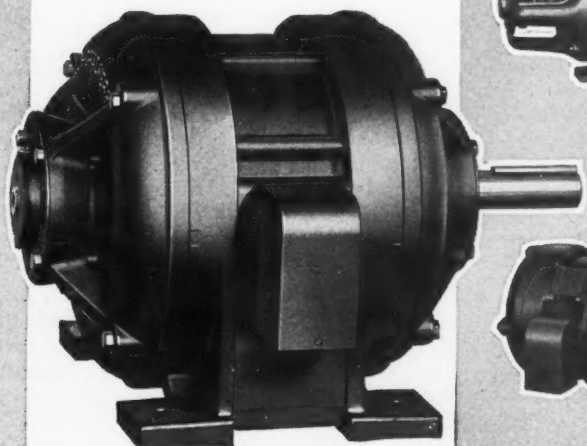
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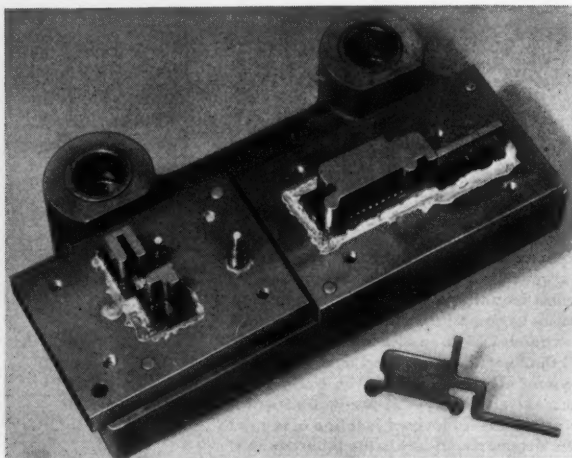


Fig. 2—Two-stage progressive or gang die. Punch holder shows matrix construction. Unlimited freedom in layout between parts is evident, and punches of irregular outline can be made in several pieces, resulting in economy whenever a replacement is necessary.

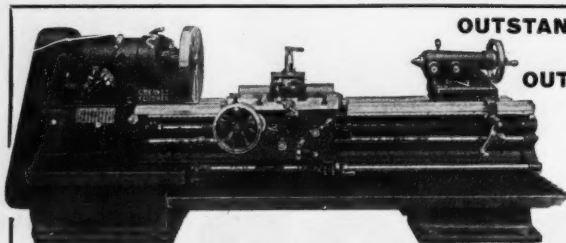
the loss if each punch were made in a solid piece, because only the damaged section need be replaced.

If a die block consists merely of one piece that can be anchored in place easily by means of screws, the matrix method of construction offers the advantage only of eliminating screws and dowels. However, this advantage is important enough in the case of dies where space is limited and it makes it possible to avoid a real source of danger in hardening.

The use of matrix should not be regarded as a makeshift. In the best shops it is looked upon simply as an economical and efficient method of securing permanent dies and punches

frequently employ it as a method of securing such parts in designing a new die. One of its great advantages is the fact that, although the matrix permanently holds each piece in place, if it is desired to loosen and remove any part, this may be done by applying a little localized heat to the holding alloy. The melting temperature of matrix of the composition mentioned is only 248 deg. F. which is safely below any temperature that would begin to draw the hardness of the die.

In many cases the matrix method furnishes a practicable means of constructing dies that would be economically impracticable to produce by



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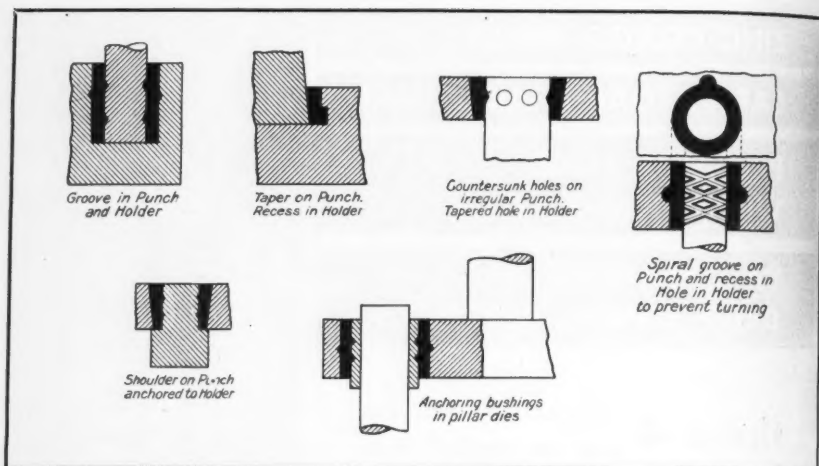


Fig. 3—Drawing showing effective methods of anchorage when using matrix. The matrix is indicated by the solid black. These are only a few of the more commonly used methods of anchoring.

any other method. In choosing this type of construction, the designer need not fear that he will run into new sources of trouble, for the use of matrix makes it possible to simplify design and the technique of its use is easy to master. Besides, by eliminating some of the more difficult shop operations and keeping screw and dowel holes out of the dies to be hardened, he secures the cooperation of shop executives and avoids the usual antagonism to new methods.

Properties of the Matrix

Although a variety of materials have been used to a limited extent as a matrix, besides the one described in this article, in most cases they have been found wanting in one or more important characteristics. The one featured here has a tensile strength of 13,000 pounds per square inch, Brinell hardness of 19 and an elongation of less than one per cent. It is sufficiently hard to hold punches permanently and has the unique property of expanding slightly upon cool-

ing. Expansion is approximately .002 in. per inch.

The matrix melts at 248 deg. F. The pouring temperature in setting die and punch parts is 300 deg. F. to 350 deg. F. Freezing range is 260 deg. F. to 216 deg. F. Within this range it can be handled with a trowel or spoon.

Importance of Anchorage

The keynote of the entire matrix method is simplicity. Learning a few simple basic principles and acquiring a little knack in pouring the metal are all that are required of the operator. One thing he must bear in mind, however, is that the matrix forms no mechanical binding and in no way "wets" the steel of the punch or die or the casting of the die shoe or punch-holder. Therefore, it is always necessary to provide a mechanical anchorage, both from the alloy to the piece to be held and from the alloy to the die shoe, punch plate or other medium.

The drawing Fig. 3 illustrates a

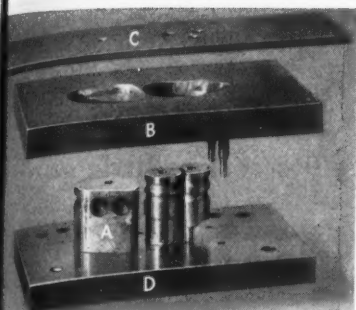


Fig. 4—(A) Punch ready for anchoring in position. (B) Punch plate. (C) Auxiliary plate until only for pouring. (D) Die plate, which is removed from bottom die to hold punches in position until after anchoring.

few of the more commonly used forms of anchorage. Individual designers can readily devise types of anchorages particularly applicable to their own problems. There are no hard and fast rules in this respect, as long as it is remembered that every piece held by the matrix must be anchored in some manner to the alloy and the alloy to the holder.

Where it becomes necessary to anchor a piece against rotation, any cavity that will break up the symmetry of the outline, such as a small offsetting hole or a chisel dent is sufficient in the holding part. On the piece itself it is merely necessary to grind a flat spot.

The term "anchorage" may sound complicated but is really very simple. In the drawings, the grooves seem to follow carefully the outline of an irregular hole. However, regular shop practice has reduced this to nothing more than a few cuts here

and there with a chisel or an undercutting end mill. Simple as it is, anchorage must not be overlooked. It must be included in correct matrix design.

Applying the Matrix

In nearly all die designs the use of matrix can be provided for in either the punch or the die member or, if desired, in both. General shop procedure follows a basic routine. The die is set into the cavity that has been formed in the die shoe, anchored in its position, and held by the alloy. Oversize locations are then cut for the punch parts. The punches are moved about manually until their correct locations in relation to their corresponding die parts are secured, and are then temporarily clamped or anchored in position by means of small holding screws. The space provided for the alloy is heated, after which the matrix is poured in and allowed to solidify.

Provision must be made for the introduction of the molten matrix into its pocket, which is usually done by chipping out a channel in one corner or at some other convenient point with a chisel. Usually this channel is

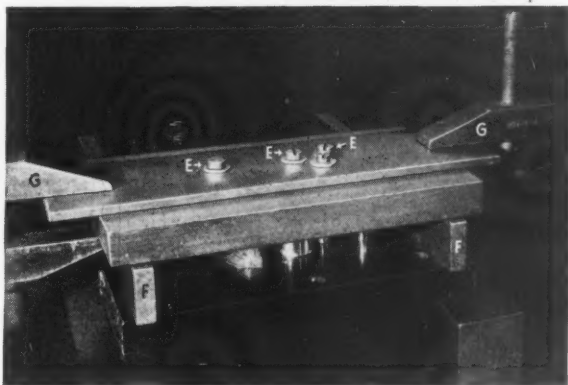


Fig. 5—Spacing bars F preserve spacing between plates D and B.

WE ASK YOU--

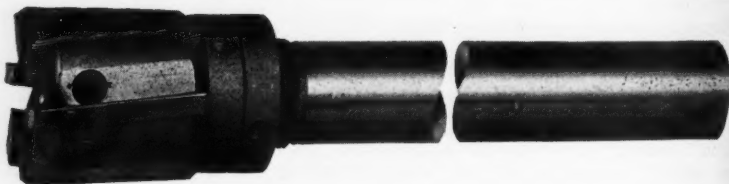
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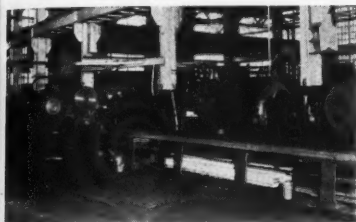
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The Roster of the Discerning

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These machinery manufacturers—and many others that are not mentioned simply because this space is too small—equip their



"their customers profit"

product with air cylinders and, to enable their customers to make most efficient use of these machines—Ross Operating Valves are installed to insure quick, positive, economical control of the cylinders.

These firms are not leaders simply because they use Ross Operating Valves on their equipment. Rather, they choose Ross Operating Valves because they are leaders—they are discerning—they recognize the importance of faultless air control. Here is the list:

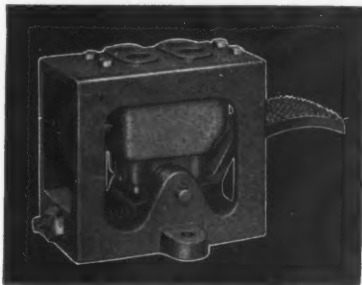
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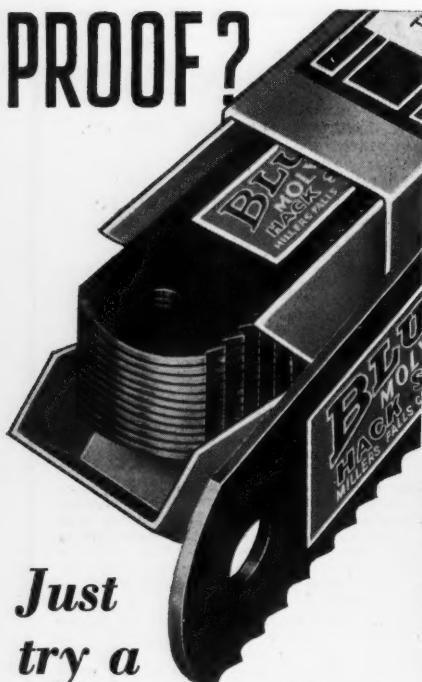


"—or foot controlled"

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omitted from the drawing, as the die-maker can be relied upon to provide it.

After the matrix has been poured, the temporary clamping mechanism is removed and the assembly is permanently located. If necessary the parts may be loosened at any time by a local application of heat. One vital precaution must be observed, however; the die blocks and punches must rest firmly on a solid steel or iron foundation, and no matrix must be al-

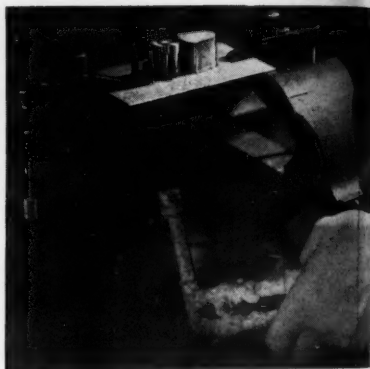


Fig. 6—Assembly in reversed position, ready for pouring of matrix.

lowed to filter in beneath either die block or punch.

In cutting locations for the die and punches in the die shoe or punch plate, no attempt need be made to follow the outline of an irregular-shaped piece. The hole can be larger and of convenient shape; if the matrix is allowed to completely fill the hole it will take care of irregularities.

Typical Applications of Matrix

In sharpening punches and dies, the usual methods of grinding are followed, of course. If the steel should wear down to the level of the matrix, some of the matrix may be removed by careful heating.

The procedure involved in locating and securing punches by the use of



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matrix metal may follow any one of several methods, one of which is described here. Referring to the illus-

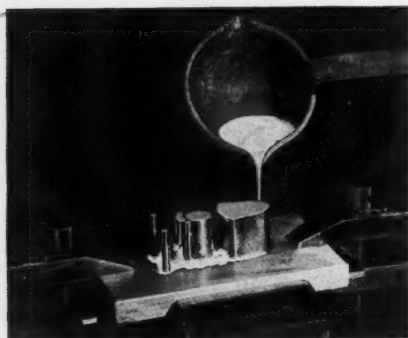


Fig. 7—Pouring the matrix.

tration Fig. 4, the punches to be anchored in position by the use of the matrix are indicated at A, B is the punch plate, which is part of the die

assembly, C is an auxiliary plate used only until the operation of pouring the alloy is completed, and D is the hardened die plate which has been removed from the bottom die to hold the punches in their proper positions until they have been fastened to the punch plate B and auxiliary plate C.

Note the anchorage recesses in the sides of the punches A, also the tapped holes in the top surfaces for anchoring the punches to the plate C. The openings in plate B are usually made $\frac{1}{8}$ to $\frac{1}{4}$ in. larger than the punches, and have tapered sides or are undercut to afford suitable anchorage for the matrix. The holes in plate C are large enough to allow a certain amount of play in the making of the temporary assembly. When the punches are inserted into their holes in the die plate D, clearance shims are often used between the punches and die to align the punches properly.

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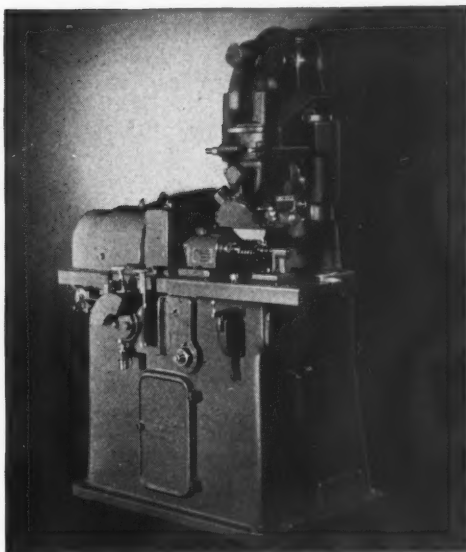
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 Use the



B-C No. 3 Hob Sharpening Machine

When difficulty is encountered on a hobbing operation in regular production it often originates in the hob sharpening. Delays, "grief", and expense in this connection can be eliminated by using the Barber-Colman No. 3 Automatic Hob Sharpening Machine shown above. This machine does a far better, more accurate, more uniform and faster job than any hand-operated grinder can be expected to do. Set-up is simple, indexing accurate, feed-rate and depth of grind positively controlled. A few simple adjustments prepare the machine for sharpening straight- or helical-gashed hobs, or formed cutters, with radial tooth-faces or rake. Uniformly accurate sharpening then proceeds automatically so that one operator can run other machines also if desired.

Sharpening hobs of any make is easy on the Barber-Colman No. 3 Automatic Hob Sharpening Machine. Profitable, too. Manufacturers using hobbing machines are invited to write for descriptive literature.



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 HOBS, HOBBING
 MACHINES, HOB
 SHARPENING MA-
 CHINES, REAMERS,
 REAMER SHARP-
 ENING MACHINES,
 SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant ROCKFORD, ILLINOIS, U. S. A.

The second step in the assembling process is illustrated in Fig. 5. Spacing bars, indicated at F, are laid on the die plate D to preserve equal spac-

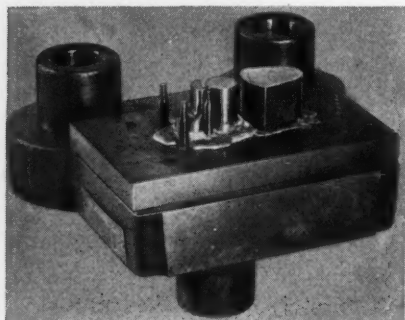


Fig. 8—Completed punch assembly.

ing between the plate D and B, as shown. Plate B is then laid on the spacing bars and centered to provide equal clearance on all sides of the punches where they project through the apertures in the plate. Plate C is then secured to the punches by means of the screws E. Plates B and C are then clamped together with the screw clamps G.

Figure 6 illustrates the third step in the operation, in which the punch assembly is turned over, putting the punches uppermost and ready for the pouring of the matrix. In order to avoid chilling the molten metal when it is poured into the grooves, the plates B and C are preheated with a torch to a temperature nearly that of the melting point of the alloy. In preheating the plates, however, the torch must be held on the underside of the assembly in order to avoid any possibility of drawing the temper of the punches.

The operation of pouring the ma-

trix is shown in Fig. 7. Best results are obtained when the matrix is heated to a temperature of between 300 and 400 deg. before pouring. After the pouring is completed, the alloy should be allowed to cool thoroughly before removing clamps C and screws E. The matrix hardens with age, consequently many diemakers prefer to allow the die to stand for at least 12 hours, or overnight, before putting it into service.

Figure 8 shows the complete punch assembly after the holding plate has been fastened to the punch holder. The design of a piercing die is shown in Fig. 9.

It is very evident from the foregoing description that a considerable amount of time and expensive hand labor has been saved in this case, as compared with some of the older methods of locating and anchoring punches. The job described here is of the common variety. On the larg-

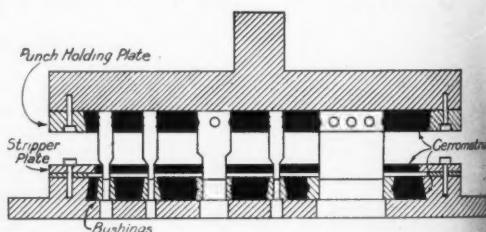


Fig. 9—This drawing illustrates an inexpensive method of making a piercing die, including the stripper plate. The essential parts are the punch holder, die shoe and stripper plate with large apertures, punches with bushings to fit, and a template of the perforated blank for use in locating the punches and bushings.

er, more complicated dies, the savings are in many cases so great that no progressive shop can longer afford to ignore the possibilities of the matrix method as a substantial measure of economy in the making of dies. The simplicity and practicability of the method mark it as a step forward in modern die-making practice.

(All illustrations courtesy Cerro de Pasco Copper Corporation.)



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Welding Torch Guide

By S. R. MORRIS

ALTHOUGH we cut considerable sheet metal with an oxy-acetylene torch, there is not enough of such work in our small shop to justify the purchase of a machine for guiding the torch across the metal. We therefore designed and built the guide illustrated herewith for this purpose. The cost was small, because the material used was mostly odd pieces of metal and the work was done during spare time. Dimensions of the various parts may be varied a little in order to utilize available material, or to adapt the tool to individual ideas and requirements.

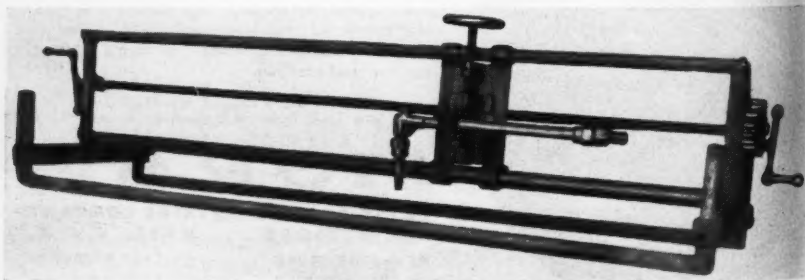
The machine consists of an adjustable clamp fastened to a carriage sliding on two guide-rods and moved by a propellor rod which is turned by a small hand crank.

The length of the implement is 3 ft. 6 in. although 4 ft. would have been better. The framework is made of pieces of iron pipe welded together,

mostly $\frac{1}{2}$ in. The base rods are 10 in. apart, with 5-in. posts at each end. The torch-holding frame is supported by 10-in. cross rods at each end having sleeves fitting around the posts, permitting the frame to be raised or lowered in order to accommodate various thicknesses of material. Set screws at each of the four posts hold the torch frame at the desired height.

The guide rods are 6 in. apart, one placed above the other and fastened at each end to posts resting on the center of the cross rods, to which they are welded. The torch carriage is a 4x6x $\frac{3}{8}$ -in. plate fitting between the two guide rods, to which it is attached by sleeves at each corner, permitting it to slide backward or forward on these rods.

The welding torch is held by a horizontal clamp, with set screw, fastened to a $\frac{3}{8}$ -in. vertical adjusting screw which fits into two short cylinders attached to the carriage plate. If a vertical cutting torch is used, the clamp should, of course, be placed in a perpendicular position. The height



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Write for Bulletin

Armstrong-Blum Mfg. Co.

"The Hack Saw People"

345 N. Francisco Ave., CHICAGO, U. S. A.



of the torch can be regulated in two ways; by turning the adjusting screw or by raising or lowering the carriage frame.

The 9/16-in. propellor rod has 13 threads to the inch and works in a clamp fastened to the back side of the torch carriage. The inner side of the clamp is smooth, permitting the carriage to be quickly slid into position. Before this is done, the outer half of the clamp—which is threaded—is dropped down, being hinged on the under side. A thumb-screw holds the clamp together while the machine is in use.

It will thus be seen that there are also two ways of moving the torch carriage; by turning the propellor rod or by pushing the carriage along the guide rods when the back clamp is open.

The propellor rod is turned by either of two small hand cranks, one of

which is welded to the outer end of the rod, the other fastened to a 3-in. gear attached to the opposite end of the frame. This gear meshes into a smaller one welded to the propellor rod, increasing the speed 2½ times. Two speeds are thus provided, adapting the implement to the cutting of thick or thin material.

Welded "Safety" Ladder

By J. H. HALE

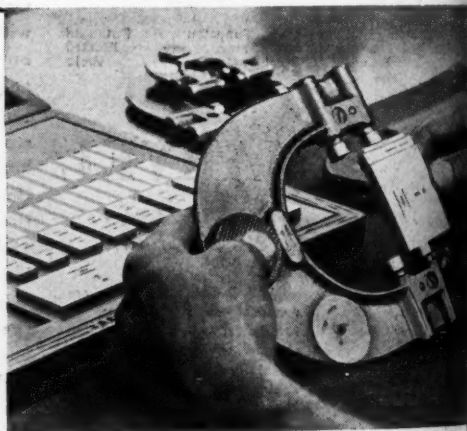
THE drawing illustrates the design of a ladder which was made for use in a pit where the floor is very oily and slippery. The construction is simple, however, and such ladders can easily be made in any shop that has a welding outfit.

The side rails of the ladder are of 1¼-in. standard iron pipe, and the rungs are of ½-in. iron pipe, as indicated. The side rails are drilled to

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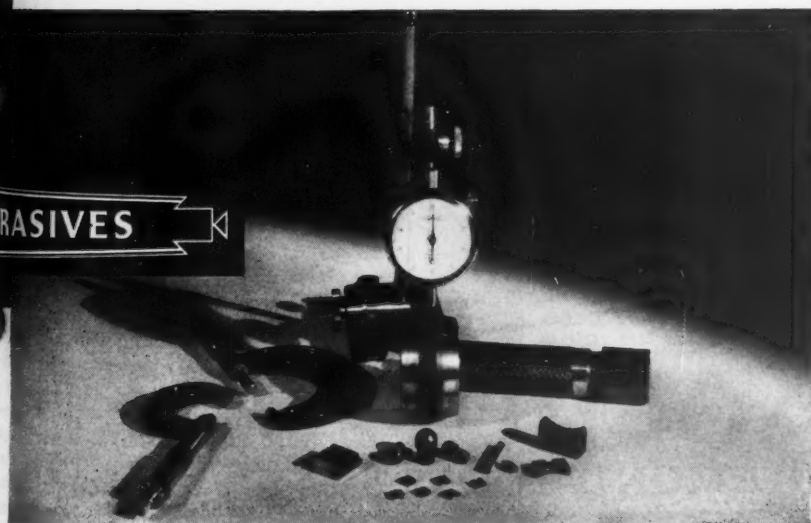
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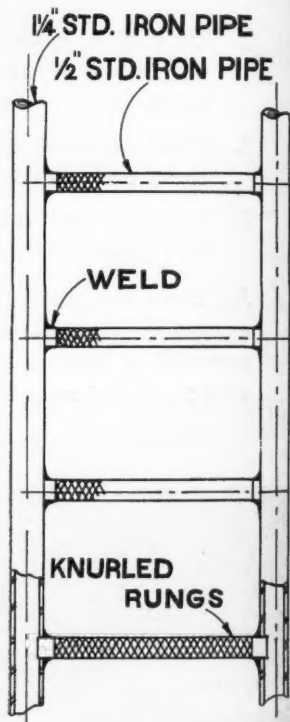


KOEBEL

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receive the end of the rungs, and the rungs are then welded in place. Before using the rungs, however, they are placed in the lathe and knurled so as to present a rough surface and thus afford a firmer footing than is afforded by the smooth metal of the pipe.

The ladder is economical to make,



Safety Ladder of Welded Construction

much stronger than the usual wood ladder, and will last indefinitely without necessity of repairs. The ends of the side rail sections can be countersunk at the bottom so as to present sharp edges to the floor and thus increase the safety features, or the bottom ends can be forged into points that will imbed themselves

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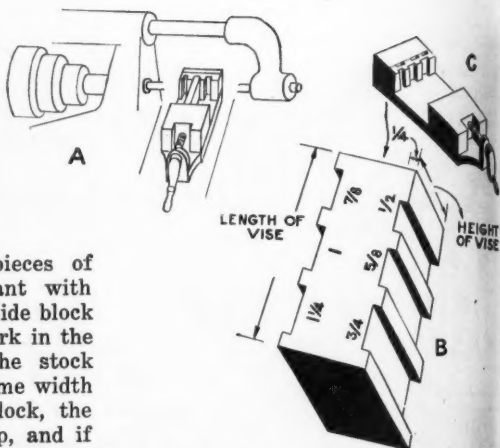
slightly in the wood of a plank floor and thus prevent slipping.

Guide Block for Milling Machine

By ROGER C. DICKEY

ONE of the handiest pieces of equipment in the plant with which I am connected is a guide block that is used in setting up work in the milling machine vise. If the stock that is to be milled is the same width as the slots in the guide block, the stock is instantly squared up, and if it is not, wedges can be used to hold it in position. The slots in the block can be made to accommodate the widths most used.

A vise in position on the milling machine table, with a guide block in



(a) Guide Block in Use in Milling Machine Vise. (b) Dimensions of Guide Block. (c) Guide Blocks in Position in Milling Machine Vise.

the vise, is shown in the drawing at A. The block itself is shown at B,

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and at C the block is again shown in the vise.

An analysis of the sizes of stock most commonly used in our plant showed that the sizes in most demand were $\frac{1}{2}$ in., $\frac{3}{8}$, $\frac{1}{4}$, $\frac{3}{16}$, 1 and $1\frac{1}{4}$ in. A pair of blocks will accommodate six different sizes, and by supplying the operator with two or three different sizes of blocks, the sizes of stock accommodated can be multiplied.

The block is about 1 in. thick and the length should equal the width of the vise with which it is to be used. It should be high enough to come flush with the top of the vise. The block can be made of cold drawn steel or any other available material. It is not necessary to anchor the guide block to the vise; thus it can instantly be turned to accommodate different sizes of stock.

"Safety" Holder for Turret Tools

By JOHN A. HONEGGER

AMONG the "mean" jobs with which a machine operator has to contend is the type of job in which a drill or reamer must be handled with extreme care due to the tendency of the tool to stick in the work. When this happens, it usually results either in a broken tool or in the work-piece being pulled out of alignment in the chuck. In either case, time and money are wasted.

The drawing illustrates the design of a holder which will withstand torque rigidly to a certain point, after which it will slip and allow the tool to revolve with the work until the machine can be stopped and thus save the tool from being broken.

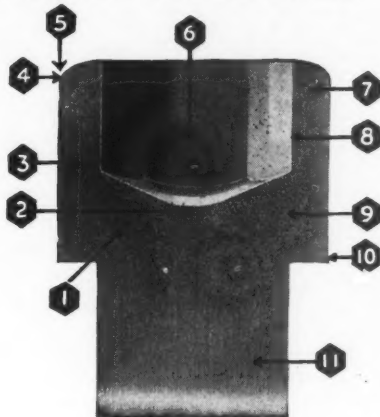
The body of the holder, A is counter-bored in the end to a running fit for the part carrying the sleeve B. From the rear of the part B extends the stub shaft C, which is retained by

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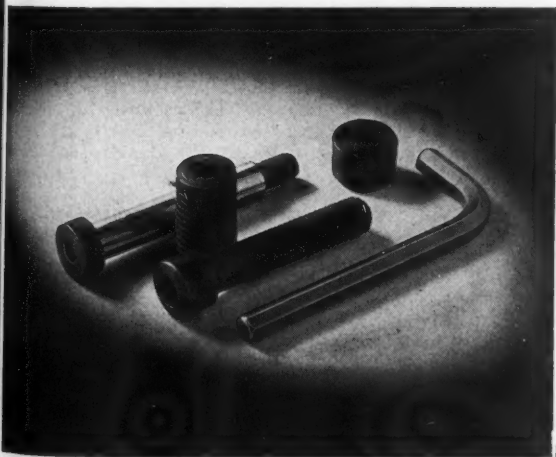
- 1 Increased Strength
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a grove and pin, as shown. The thrust of the sleeve is taken by the thrust bearing D. A slot is milled in the counterbored section of the

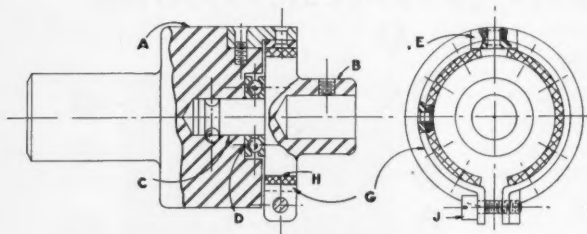
quired to grip the tool.

When the band is properly adjusted, the sleeve will hold for all ordinary drilling or reaming operations but will

revolve under an extra load, such as would be applied if a reamer were to jam in the work. This type of holder is of decided advantage on jobs where bottoming tools are used, or where there is a possibility of running into hard

spots in the metal, or where the design of the work-piece is such that a tool may easily jam against an interior fin or wall.

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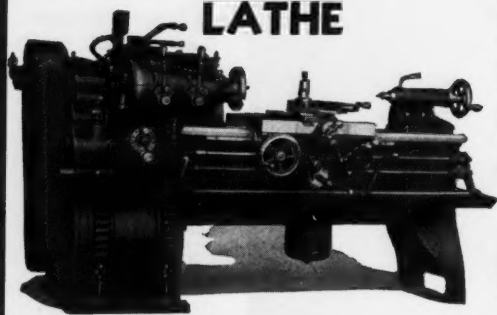


Drawing of Safety Holder for Turret Tool

holder for the brake band holder E, which is anchored in place with machine screws. To the holder is riveted the brake band G, carrying the brake lining H. The brake band can be adjusted by means of the screw J so that the sleeve will be held with the exact amount of pressure re-

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Over the Editor's Desk

Conditioned Air and Accuracy

IT is interesting to note that air conditioning equipment, usually thought of as an aid to comfortable living in hot weather, especially in theatres, trains, and other concentration points, is rapidly becoming an important aid to accuracy and fine workmanship in the metal manufacturing industries.

Twenty-six years ago your editor was among the employes in a railroad shop in Indiana where the superintendent (who had never seen one previously) considered the micrometer an ingenious device but ridiculed the idea that anyone could work to such fine dimensions as thousandth parts of an inch. Twenty-two years ago a plant manufacturing automobile starters was grinding the small motor and generator shafts to limits of 0.0002 inch, and considered this the last word in close manufacturing.

Last month the writer spent some time in a plant that builds mechanical refrigerators, where certain parts used in the refrigeration units are lapped to a limit of absolute zero. This is only possible, of course, where the air is conditioned to the proper temperature and humidity. And in this plant not only the inspection department but the assembly department as well is completely air conditioned. Conditioning the air not only assures that all parts used in the assemblies will fit perfectly, but it is necessary in order that certain finishing processes may be accurately completed and so that a definite check may be made on the accuracy of finished parts.

Where close accuracy is important, air conditioning is fast becoming recognized as a necessity. Practically every large automobile factory con-

ditions the air in its inspection department, at least, and in many plants conditioned air is supplied for the test, assembly, and other departments. Thus industry takes another stride forward.

Flood Damage

THE resourcefulness of modern industry is never more apparent than during times of stress such as those through which portions of the Connecticut, Ohio, Potomac, and Susquehanna Valleys and other parts of the country have just passed.

Long after the waters have returned to their banks stories will be told of how 100 steam specialists were rushed hundreds of miles by motor truck to aid in servicing generator units so that light and power could be made available; of how a large motor manufacturer's superintendent and service manager built drying ovens by candle light so that electrical equipment could be dried out for the owners; of how motors that had been submerged were disassembled, cleaned, dried out, treated with insulating varnish, baked, and delivered back to their owners within 48 hours, and so on.

The advantages made available by modern inventive genius were evidenced by the uses made of both commercial and short-wave radio which played its part in relaying requests for both new and service equipment such as electric motors, generators, bearings, pumping units, anti-rust greases, and other supplies.

We seem to be able to apply our resourcefulness to the end of solving all problems excepting the prevention of floods, or, at least, of preventing large and important cities from being flooded.

3600 PARTS PER HOUR Checked TO HALF A TENTH!

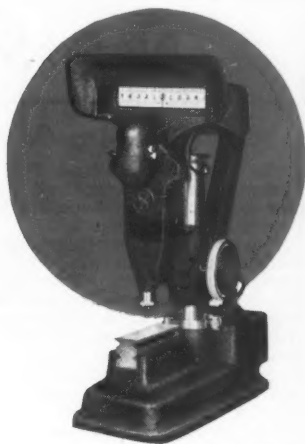
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New Shop Equipment

Rockford Hy-Draulic Planer

The Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Illinois, is now marketing the Rockford Hy-Draulic Planer shown in Fig. 1.

The application of hydraulic power for reciprocating a machine table has numerous outstanding advantages. First of all, it eliminates heavy reciprocating or rocking parts, joints, linkages, and gears, from the table drive. It simplifies construction and makes direct application of power most economically. It lengthens the life of cutting edges; and provides a smooth, powerful, steady cutting stroke which can be adjusted instantly to any desired rate within the capacity of the hydraulic equipment. It eliminates "gear marks" on the work and prevents chatter. The cutting speed of the table reaches the established rate almost instantly upon reversal and remains constant throughout the entire stroke. Table reversals occur without shock in a minute period of time. The rapid return-rate of the table is constant, regardless of the cutting speed employed. Suitable hydraulic equipment makes it possible to obtain the maximum in cutting speeds, return ratios, strokes per minute, and metal removed in any given period of time. In addition the hydraulic drive actually increases the useful life of the machine to which it is applied and reduces maintenance cost.

Hydraulic pressure is also employed in

this planer for feeding all heads. The feeds, like the cutting speeds, can be adjusted instantly to any desired amount whatever within the capacity of the machine, and the feeding movement is very smooth and rapid.

Referring to Fig. 1; the "power house" for the machine is seen at the right-hand end of the bed. The unit comprises the main driving motor directly connected to the hydraulic power unit, both mounted on a heavy base, and all solidly secured in position. This compact efficient arrangement reduces the number and length of the necessary hydraulic connections, eliminates vibrations, provides complete protection, accessibility, and ample ventilation. Hand-wheels on either side of the hydraulic power unit enable the operator easily to adjust cutting speeds and the rapid return rate.

The double-length box section bed has heavy ribbing throughout. Table also is box section and has the customary T-slots, hold-down holes, adjustable control dogs, and clean-out openings, chip pocket and tool tray at one end, double oil-wipers at both ends for both ways.

In the center, Fig. 1, will be seen the massive column which supports the cross-rail and contains the electrical and hydraulic control panels. Mounted on top of the column is the motor-driven mechanism which provides rapid traverse to all heads and power elevation for the rail. Fig. 2 is a close-up of the column, heads, and rail. Note especially the large casting, in the form of an in-

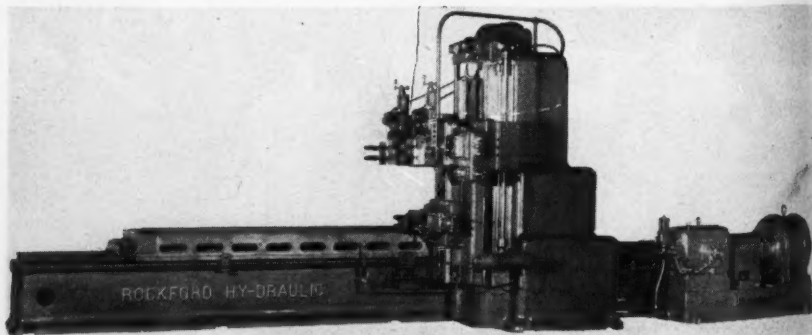


Fig. 1—Rockford Hy-Draulic Planer

KNURLED

UNBRAKO

Socket Head Cap Screw



Every mechanic, when driving screws, will invariably use his fingers as much as possible, because they are much handier than any wrench and save time.

With the Knurled "Unbrako" he can drive much faster, as his fingers actually become geared to the Knurled Head so they can't slip.

Smooth Head Screws, hard to get hold of are much slower to drive.

The Knurled "Unbrako" is of exactly the same high quality as the smooth head "Unbrako",—

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Fingers become geared to the knurled "Unbrako" and therefore can't slip

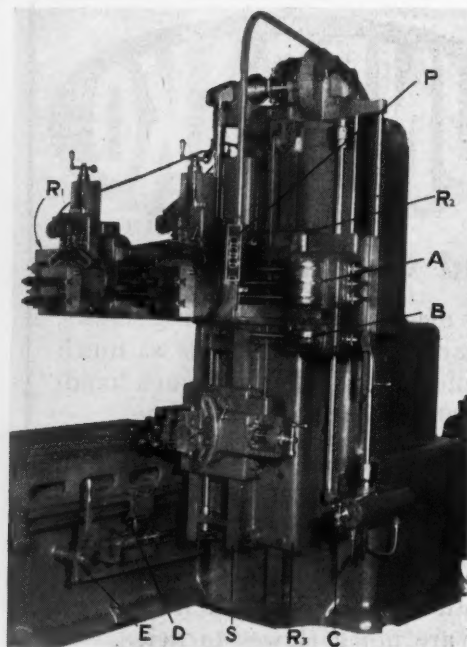


Fig. 2—Close View of Column, Heads, and Rail

verted L, indicated by R1—R2—R3. This casting includes, in one piece, the cross-rail and its long wide vertical bearing on the column.

Securely mounted on this slide is the side-head rail, which is pivoted at its upper end and provided with a fine adjustment at its lower extremity. This construction provides a permanent means for accurately aligning the side-head rail which is then solidly secured in position by heavy bolts.

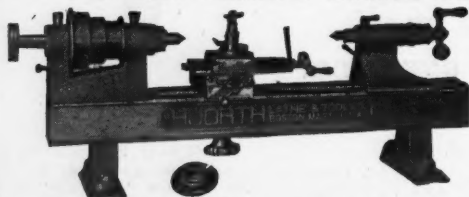
The admirable centralization and convenient location of the operating controls for this machine are also shown in Fig. 1. The pendant, P, contains push-button controls which establish the direction of rapid traverse for the rail-head, a master motor switch, and a rod by means of which the machine can be stopped instantly. The three levers A provide complete control for the power-operated movements of both rail-heads including feed or rapid traverse to left or right, up or down, separately or in unison. Lever B performs the same service for vertical movement of the side-head. By means of the ball-crank C, the operator can secure instantly any desired feed rate whatever within the capacity of the machine. Lever E starts and stops the table movement; lever D reverses its direction. Both of the rail-heads shown in Fig. 2 are equipped with automatic tool relief devices which raise tools out of contact with the work during the return stroke.

The openside construction of this planer is shown in Fig. 3; the rigid box-section cross-rail back brace with its broad base, powerful locking bolts, and tapered gib. In this side of the machine-bed will be seen duplicate controls for starting, stopping, and reversing the table movement. Note also the heavy sheet metal cover between the ways which extends the whole length of the bed underneath the table.

This illustration also shows the main driving motor, hydraulic power unit, and one end of the large enormously strong hydraulic cylinder for reciprocating the table.

Following are general specifications for the machine illustrated.

... for more than 1001 odd jobs



The HJorth Bench Lathe has the speed, accuracy, handling ease, and dependability that appeal to every operator. That's why you'll find the better shops equipping with the HJorth Lathe.

Write today for data and prices.

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WAREHOUSE SERVICE ON THESE EFFICIENT STEELS

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They maintain ample stocks for their customers' needs, engage complete facilities for making prompt deliveries and employ a trained organization for rapid, daily handling of a multitude of details. Through careful study of trade requirements and systematic control of incoming and outgoing stock, they function with the same high degree of efficiency that characterizes modern manufacturing methods.

These distributors specialize on Union Cold Drawn Bars—true to analyses, accurate to size and cross section, straight and smooth surfaced to increase efficiency in your production.



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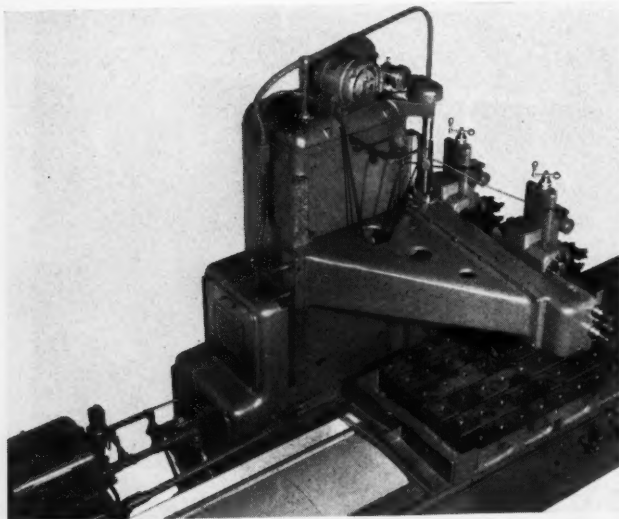
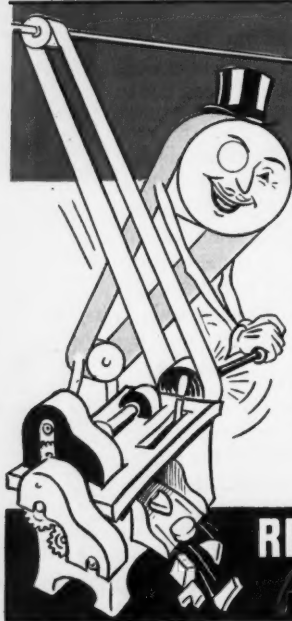


Fig. 3—View Showing Openside Construction of Planer

Maximum pull to table.....24,000 lbs. Down adjustment of rail head
Maximum distance from table to slide11½ in.

underside
of cross-
rail37½ in.
Length of bed
(optional)...
23 ft. to 45 ft.
Length of table
(optional)...
12 ft. to 22 ft.
Width of table.
36 in. or 42 in.
Center to center
of ways...18½ in.
Width of face of
cross-rail
14-1/16 in.
Width of face of
housing 10½ in.
Width of saddle
bearing on
rail14 in.
Width of side
head bearing
on housing...
16½ in.
Horizontal adjust-
ment of side
head slide 11 in.



MR. WELL DRESSED BELT

BOOSTS MACHINE SPEED

5% and more increase in delivered HP is the experience of many plants regularly using Research Belt Dressing. Regular treatment of your belts with Research Belt Dressing will also result in increased average machine speed, more production, longer belting life and executive smiles. It's made by the men who make the belting. Order from your distributor or write direct to the Home of Research, Worcester, Mass.

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QUART
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½ GALLON
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GALLON
\$2.75
5 GALLON
\$12.50

RESEARCH BELT DRESSING

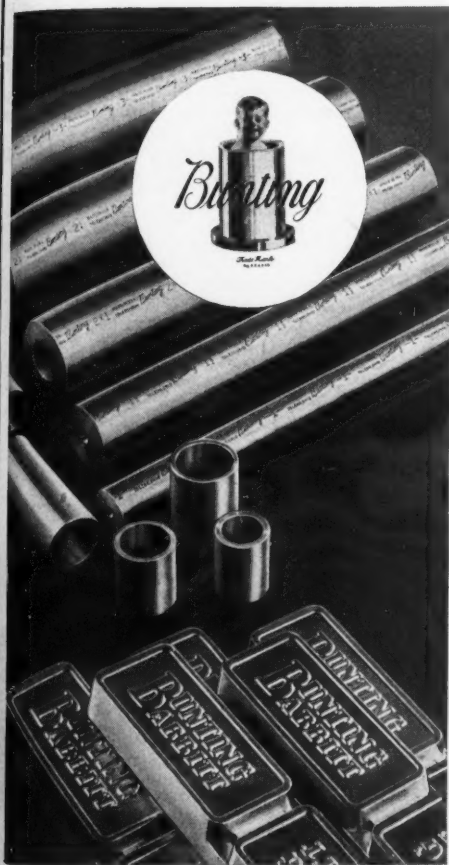
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WHY not modernize the bearing metals end of your operation? The Bunting 13" bar cuts into multiples of standard bearings and bushings without excessive waste. Factory machining and centering eliminate still more waste metal and reduce labor time enough to more than pay for the bar. 121 sizes in stock at the Bunting mill supply wholesaler in your market. Write for catalog.

600 and more different sizes of completely machined and finished—ready for assembly — Bunting Standardized Bronze Bearings graphited, oil grooved or plain as desired. Write for catalog showing sizes and prices.

Bunting Babbitt will prove to you that here is an industrial anti-friction metal that meets all your hopes and requirements. Buy it from the Bunting mill supply wholesaler.



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BRONZE BUSHINGS • BEARINGS
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ANTI-FRICTION METAL



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Reason No. 5.

RIGID INSPECTION!

"Rigid Inspection" is not just a handy catch phrase in the making of IXL Gears and drives. It's a hard, honest fact of which Foote Engineers are proud and which costs real money to maintain.

Every piece from blank to finished gear is subjected to the critical eye and tests of a trained inspector who is paid to do nothing but INSPECT.

This inspection is continuous, step-by-step as the piece proceeds from blank or billet to completion. Thus errors are caught at the earliest possible moment and you are assured of a perfect product free from flaws that may be present but

unseen where the practice of FINAL INSPECTION ONLY is depended on.



Ask for the Big IXL Handbook or let us send you literature applying to your special problem.

FOOTE BROS. GEAR & MACHINE CORP.

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IXL-5315 S. Western Ave., Chicago, Ill.

- | | |
|---|--|
| <input type="checkbox"/> Please have your representative call. | <input type="checkbox"/> Speed Reducers Spur |
| <input type="checkbox"/> Please send literature on the items checked: | <input type="checkbox"/> Worm Helical |
| <input type="checkbox"/> Industrial Gears | <input type="checkbox"/> Powered Gears |
| <input type="checkbox"/> Heat-Treated Gears | <input type="checkbox"/> Special Machinery |
| <input type="checkbox"/> Friction Clutches | <input type="checkbox"/> Stoker Drives |
| <input type="checkbox"/> Flexible Couplings | |

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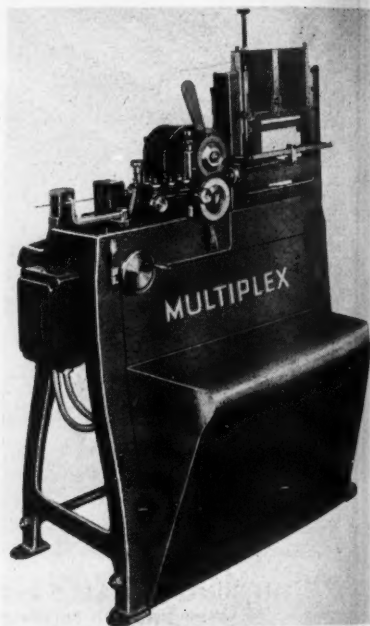
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Company.....

Cutting speeds of table per minute (optional).....0 to 50 ft. or more
Return speeds per minute (optional)10 to 150 ft. or more
Horizontal feed of rail-head..1/42 to 1/4 in.
Vertical feeds of rail-head..1/96 to 1/4 in.
Vertical feeds to side-head..1/48 to 1/4 in.
Power rapid traverse is provided for both rail-heads in both directions. Side-head has vertical power rapid traverse.

"Multiplex" High Production Wire Forming Machine

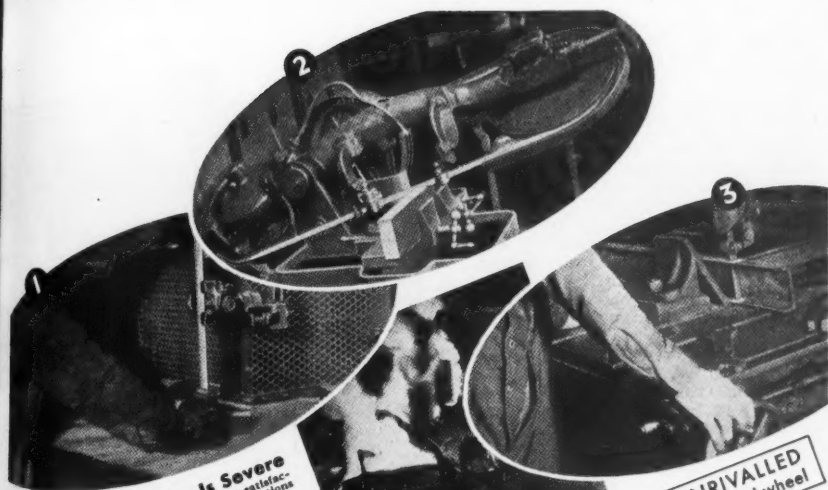
A machine into which soft wire can be fed from a reel, automatically straightened, cut to the required length and formed to the shape desired has been developed by Economical Tool &



"Multiplex" High Production Wire Forming Machine

Machine Company, 10 W. Delano St. Muskegon Heights, Michigan. The wire shapes are uniform, the accuracy of the forming depending upon the dies.

The design of the "Multiplex" machine is such that the length of the wire being cut and formed can be varied or adjusted while the machine is in operation. It is said that the dies can be



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- 3 American Manganese Bronze Co., Philadelphia
- 4 BECAUSE of Disston Electric Furnace Steel—tough, flexible . . .

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In taking the band over a band wheel

Uniformity in steel and heat treatment
Hardness in every tooth identical
Flexibility . . . speed . . . production

Disston Metal-Cutting Band Saws stay sharp, cut fast, work better on machines: do more work. Made of Disston steel, there is a Disston Band to meet every need for shape and size of teeth, set, speed, feed. Disston service goes with Disston Saws. Tell us what you are cutting. We will work with

you for better results in production volume, time, quality, economy!

Henry Disston & Sons, Inc., 421 Tacony, Philadelphia; U. S. A. Branches: Boston, Chicago, Detroit, Memphis, New Orleans, Seattle, Portland, Ore., San Francisco, Vancouver, B.C. Canadian Factory: Toronto.

DISSTON FLEXIBLE BACK

Metal-Cutting Band Saws

"Band Saws" and other Metal-Cutting Manuals, FREE. Simply write name and business address on margin below. Clip and mail to DISSTON, 421 Tacony, Philadelphia.

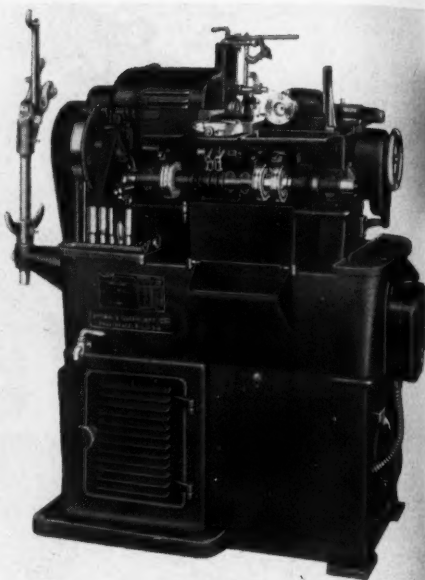
changed and the machine adjusted in less than five minutes. High grade materials are used in the construction of the machine, assuring a machine that will give years of efficient production and accurate service. High speed anti-friction and bronze bearings minimize power requirements.

The "Multiplex" will form wire up to No. 10 gauge and to 21 in. in length. A production of 100, 125, or 150 accurately-formed wire shapes per minute is available, depending upon the size and design of the shape. Power is supplied through a 1 h.p. geared motor on an adjustable sliding base, fitted with "V" belt driving providing three speeds through pulley and belt adjustment. Floor space required, 3x5 ft. Weight, 700 pounds.

Brown & Sharpe No. 00G Automatic Screw Machine (High Speed; For Motor Drive Only)

Several major changes in design, together with numerous minor structural changes, recently made by the Brown & Sharpe Mfg. Co., Providence, R. I., in the B. & S. No. 00G Automatic Screw Machine (High Speed; For Motor Drive Only) have resulted in a remarkable increase in the usefulness and productive capacity of this widely known automatic screw machine.

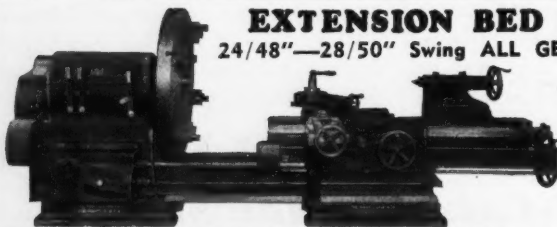
While the No. 00G has been an efficient and accurate machine, capable of maintaining high production schedules, the new design machine surpasses its predecessor by obtaining even higher production figures at lower cost regardless of the material being used. Previously, machining limitations of the



**B. & S. No. 00G Automatic Screw Machine Designed
for High Speed and for Motor Drive Only**

stock used, or limitations of the machine itself, often necessitated handling the job on another size machine where the correct surface speeds could be obtained. Now, however, it is possible to quickly obtain the correct speeds for any job up to $\frac{3}{8}$ in. diameter ($\frac{1}{2}$ in. diameter on light work) on this one machine whether the material being used is hard steel, free cutting steel, brass or any of the freer cutting materials.

Of primary importance in obtaining this unusual ability, is the fact that the maximum spindle speed has been in-



EXTENSION BED GAP LATHE 24/48"—28/50" Swing ALL GEARED OR CONE HEAD

A lathe for small and large swing work. Long distance between centers. Three lathes in one. Saves space. Reduces cost.

Write for literature.
Cincinnati, Ohio

THE RAHN LARMON COMPANY



For SENSITIVE Remote Control . . .

. . . you need a
flexible shaft that has
these 3 properties

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MINIMUM TORSIONAL DEFLECTION

2

EQUAL DEFLECTION FOR EITHER DIRECTION OF ROTATION

3

LOW INTERNAL FRICTION

. . . In
S. S. WHITE
REMOTE CONTROL
FLEXIBLE SHAFTS
you do get all three

. . . because these shafts were specially designed
for applications requiring sensitive remote control
. . . We'll be glad to furnish information about
these shafts and to cooperate with you in working
out flexible shaft application details. . . Write us.

The S. S. WHITE Dental Mfg. Co.
INDUSTRIAL DIVISION

10 East 40th St., Room 2310 S, New York, N. Y.

Why Use A Shaper to cut Keyways when a

DAVIS KEYSEATER

will do the
job so much
quicker
and
better?

Send
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circular.



DAVIS KEYSEATER CO.

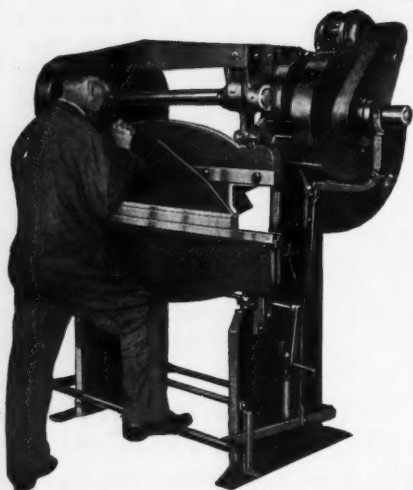
Exchange & Glasgow Sts.
ROCHESTER, N. Y.

creased by 20 per cent. There are now available 36 changes in spindle speed, the range extending from a new low speed of 200 r.p.m. to the new maximum of 6000 r.p.m., permitting the desired surface speeds for handling either the hard or the free-cutting materials. These spindle speed changes are obtained now as they were previously, by means of change gears, but improvements have been made to permit making the change with greater ease and quickness.

Of equal importance is the increase in capacity of the work spindle, which is now capable of handling regular work up to $\frac{3}{4}$ -in. diameter. This, together with the increased spindle speeds, provides for handling those borderline jobs which formerly required a larger size machine. With the aid of a larger size feed tube, light work up to $\frac{1}{2}$ -in. diameter can also be accommodated.

A few of the structural changes are improved construction of spindle and spindle parts; thorough guarding of the sides and inside ends of the cross slides and automatic oiling of the cross slides to assure continuous free movement of the cross slides; improvement in the guards which protect the turning indexing and locking mechanism; substitution of stopping plungers in the

THIS No. 253 CHICAGO STEEL PRESS



Will Do 40% to 60% of
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Out by the Average Shop

This compact, ruggedly built, 48", No. 14 gauge capacity, Chicago Steel Press brake is an economical and profitable production unit. It is ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes and a great variety of sheet metal specialties. Variable speed drive operates from 17 to 50 strokes per minute. Precision built of highest quality materials by master craftsmen.

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DREIS & KRUMP MFG. COMPANY

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GROUND from the **SOLID** *after* **HARDENING** means

The photograph at right shows the four major steps in the BATH process . . .

1. Shows the amount of material removed in grinding the shank.

2. The unfinished hardened surface as it comes from the heat treatment.

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4. Threads which are **GROUND FROM THE SOLID—AFTER HARDENING.**

Teeth which have the same grain structure as the core . . . hence neither too soft nor too brittle . . .

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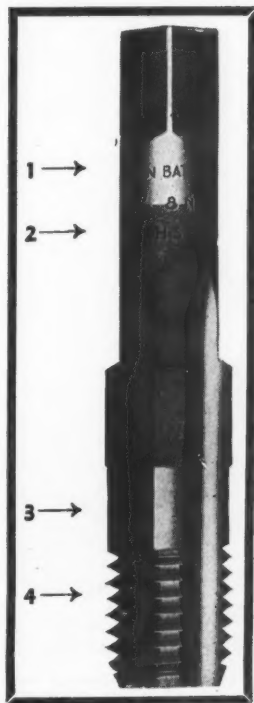
keen cutting edges that stay sharp longer . . . giving accurate, positive, high-speed cutting . . .

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Our field engineer will gladly make a survey of your tapping problems.

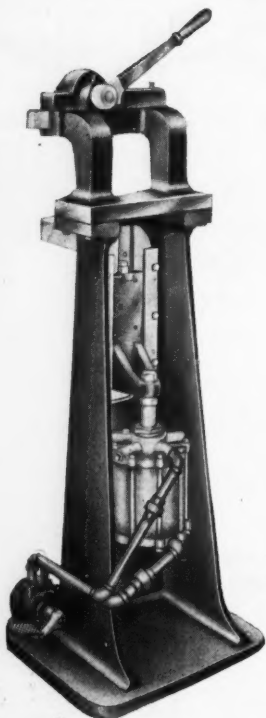


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JOHN BATH & COMPANY INC.

WORCESTER, MASS.

GIVE IT THE AIR And Eliminate Fatigue



**MODEL 25
HI-DUTY MARKING MACHINE**

This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

GEO. T. SCHMIDT, Inc.
1806 BELLE PLAINE AVE.
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turret indexing mechanism and in the chuck and feeding mechanisms, in place of stops in the driving shaft clutches to provide more positive and accurate operation of these mechanisms; use of drop forgings for all trip levers, levers, cross slide levers, chuck fork clutch forks, etc.; increase in size and redesign of oil guards to afford better protection against splash as well as more readily accommodate attachments; improvement in the swing stop mechanism to provide a more positive operation; and changes in the front spindle bearing cap and in the bed to facilitate installation of the vertical slide attachment.

The regular feed tube furnished with the machine accommodates a No. 10 feeding finger which is stocked in sizes up to and including $\frac{3}{8}$ in. round. When the $\frac{1}{2}$ -in. capacity feed tube is used on material larger in diameter than $\frac{3}{8}$ in. round, a No. 10A Feeding Finger is available in the following sizes: $\frac{13}{32}$, $\frac{7}{16}$, $\frac{15}{32}$ and $\frac{1}{2}$ in. round and $\frac{3}{4}$ and $\frac{7}{16}$ in. hexagonal. To permit the use of No. 00 Spring Collets and Feeding Fingers, an extra nut, sleeve and adapter are furnished as part of the regular equipment of the machine for use in connection with the $\frac{3}{8}$ -in. capacity feed tube.

The new No. 00G Machine is available also, in simplified form for work not requiring all of the functions of the full automatic, the Turret Forming Machine being of advantage on production work which does not require reversal of the spindle, while the Cutting-Off Machine efficiently handles the production of parts which require neither the reversible spindle nor the indexing turret features.

Cleereman Sliding Head Drilling Machines

The Cleereman Machine Tool Co., Green Bay, Wis., announces an improved line of Cleereman All-Geared, Anti-Friction Bearing, Automatically Oiled Sliding Head Drilling Machines. The machines are designed with nine feeds ranging from 0.005 to 0.045 in., and with twelve spindle speeds in two ranges of 50 to 1000 and 75 to 1500 r.p.m.

As illustrated, the machines are built in the round column type and are available in sizes of 21, 25 and 30 in. They can also be set up in gangs of from two to six spindles. Arrangements for single purpose production tooling can be provided to suit individual requirements.

The speed and feed gears and shifting

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*Will Cut
All Kinds
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WELLS BAND SAWS

***Reduce Metal Cutting Costs
from 30 to 50%***

**DEALERS
WANTED!**

For maintenance,
tool room or general
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this is a unit needed
by every metal work-
ing plant. 99% of
metal installations
have produced sales.
The Wells Band
saw will build vol-
ume and profits for
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All cutting can be done at high speed without the use of coolant. Rigid saw guides insure constant accuracy. No time lost re-aligning material. Handles any metal—in any shape or thickness up to generous capacity of unit. Sturdy, dependable, designed to stand up under hard service. Look into these advantages. Send for the descriptive folder today.

THE WELLS MANUFACTURING CORP.

315 SEVENTH AVENUE, THREE RIVERS, MICHIGAN

Representative in England: Gaston E. Marbaix, Ltd., Vincent House, Vincent House Square, London.
New York and Connecticut Representative: Wm. Halpern & Co., 53 Park Place, New York City.

No. 11 of the Series

WHAT ARE THE VARIOUS COATED ABRASIVES?

What Are Their Uses? COMPARATIVE GRADINGS

By E. B. GALLAHER

Editor, Clover Business Service
Treasurer, Clover Mfg. Co.

OUR LAST AD in the series (No. 10) told you how to order correctly, and the subject of this ad could well have been incorporated in No. 10, except that it seems to us of enough importance to be treated separately.

● Gradings of various abrasives are different.

Abrasives may be divided into two classes as follows:

(1) Non-technical abrasives—Flint and Emery.

(2) Technical abrasives—Garnet, Aluminous Oxide and Silicon Carbide.

● The non-technical abrasives are graded very much the same, that is a No. 1/0 Emery is, in size of grain, about equivalent to a No. 1/0 Flint. Non-technical abrasives are designated by grade number only, such as 1/0, 1/2, 1, 1 1/2, etc., and not by screen mesh numbers.

● The technical abrasives—Garnet, Aluminous Oxide and Silicon Carbide—are all graded and controlled through the same screens. Both a grade number and a screen number are used in designations. However, it is to be remembered that the technical abrasives are graded through screens that are coarser by approximately two grades than the non-technical abrasives. That is, a No. 1/0 Garnet or Aluminous Oxide is equivalent in size of grain to a No. 1 Flint.

● Technical abrasives may be identified by the screen mesh number alone (such as No. 100), or by a combined grade number and screen mesh number (such as No. 2/0-100). The numeral 100 designates the mesh of the controlling screen used in the manufacture of this particular grade.

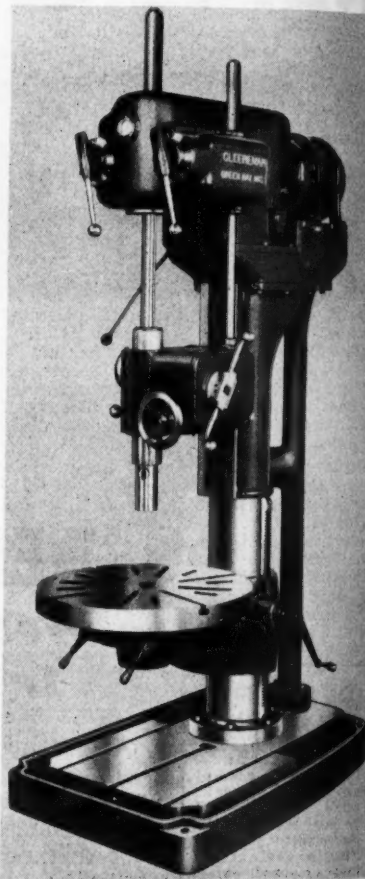
● The word "Emery" has long been erroneously used in ordering almost all kinds of technical abrasives, and confusion immediately arises because the grading of Emery is different than that of the technical abrasives; and, of course, the abrasive itself is different. See No. 7 of the Series.

● File these ads for reference.

CLOVER MFG. CO., NORWALK, CONN.

Also makers of the famous
**CLOVER GRINDING AND LAPPING
COMPOUNDS**

mechanism are housed in feed and speed boxes built on the unit principle. They are full ball bearing, compact, and very simple. The design of both the speed and feed mechanism is such that on one lever is required for each unit, making it possible to change from any speed



Cleereman Sliding Head Drilling Machine

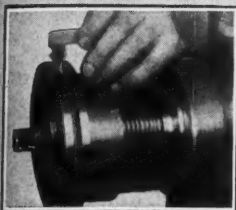
direct to any other. All shafts in the speed box are in horizontal position. All gears are of chrome molybdenum steel, heat treated, and all shafts are of chrome nickel steel.

Bevel gears used to drive the spindle are of the spiral type, providing a con-

LUFKIN

TAPES - RULES - PRECISION TOOLS

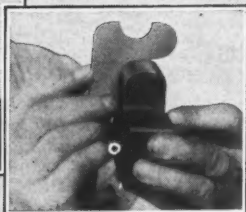
The most practical and convenient RADIUS GAGES



Checking
Forming
Roll.



Checking Form Cutter



Checking Forming Punch



**OUTSTANDING FEATURES
FOUND ONLY IN LUFKIN
RADIUS GAGES:**

*Each Gage is a separate unit
and has five applications to the work*

*Each Gage carries the corresponding ex-
ternal and internal forms, the practical
combination.*

*Each Gage is prominently marked with
its Radius and all Gages comprised in a
Set are put up in attractive leatherette
folder; makes most simple and easy the
selection of the individual Gage wanted.*

*Radius Gages are offered in four dif-
ferent Sets.*

SEND FOR TOOL CATALOG No. 7

**Specify LUFKIN Tools for
your shop equipment**



NEW YORK

106-110 Lafayette St.

THE LUFKIN RULE CO.

SAGINAW, MICHIGAN, U. S. A.

Canadian Factory

WINDSOR, ONT.



ONLY Sutton DIAMOND GRIP Collets are diamond-ripped. Send for new No. 12 Sutton Catalog showing collets and fingers for automatic and hand screw machines.

Sutton Tool Company

2838 W. Grand Blvd., Detroit, Mich.

NEAT STAMPING IN NAME PLATES



This machine quickly stamps details and serial numbers into name plates.

Write For Particulars

GEO. T. SCHMIDT, Inc.

1806 Belle Plaine Ave., Chicago, Ill.

stant, smooth drive to the drill or boring tools. The spindle unit is equipped with both radial and thrust bearings, the spindle nose bearings being preloaded to eliminate shatter and end play. Spindle and sleeve are of heat treated molybdenum steel forgings, are six-spined, and are provided with an automatic dephasing. Parts of the feed mechanism subject to wear are chapmanized.

Gears and bearings in the speed head and gear box are automatically oiled by the pressure pump system. The sliding head is lubricated by an oil reservoir, the worm in the head being submerged in oil.

No frictions or clutches are used for controlling the starting, stopping or reversing of the spindle; a standard ball bearing 1200 to 1800 r.p.m. reversing motor of low starting current and high torque is used in conjunction with built-in push button controls for the forward reversing, and stopping of the spindle. This method provides high speeds for tapping. The driving motor is located at the rear of the main head, where it is direct connected.

South Bend 9-In. Workshop Lathe with Underneath Belt Motor Drive

The South Bend Lathe Works, South Bend, Indiana, announces that the new 1936 Model 9-Inch "Workshop" Lathe is now available in the Underneath Belt Motor Drive.

The lathe is mounted on either frame or cabinet bench while the underneath motor drive unit and motor are supported on a pivoting frame to the underside of the bench top. The belt tension release crankhandle controls the position of the frame and countershaft. When the tension release crankhandle at the front of the cabinet is moved in a semi-circle, the entire driving unit is lifted vertically about 2 3/4 inches so that the spindle belt may be shifted. Any

ACE SPOT WELDERS

MODEL 60—
With water-cooled electrodes, for continuous production, maximum 2 pcs. 16 Ga. C. R. Steel. Complete with stand.

PRICE, ONLY \$75.00

Sample welds and literature on other sizes upon request.

PIER EQUIPMENT MFG. COMPANY

1283 Milton Street
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April, 193

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Here's the two spindle bench drill you've been waiting for!
Extremely accurate — sturdy, smooth-in-operation at a new
low price for a drill of this quality! Write for bulletin and prices!

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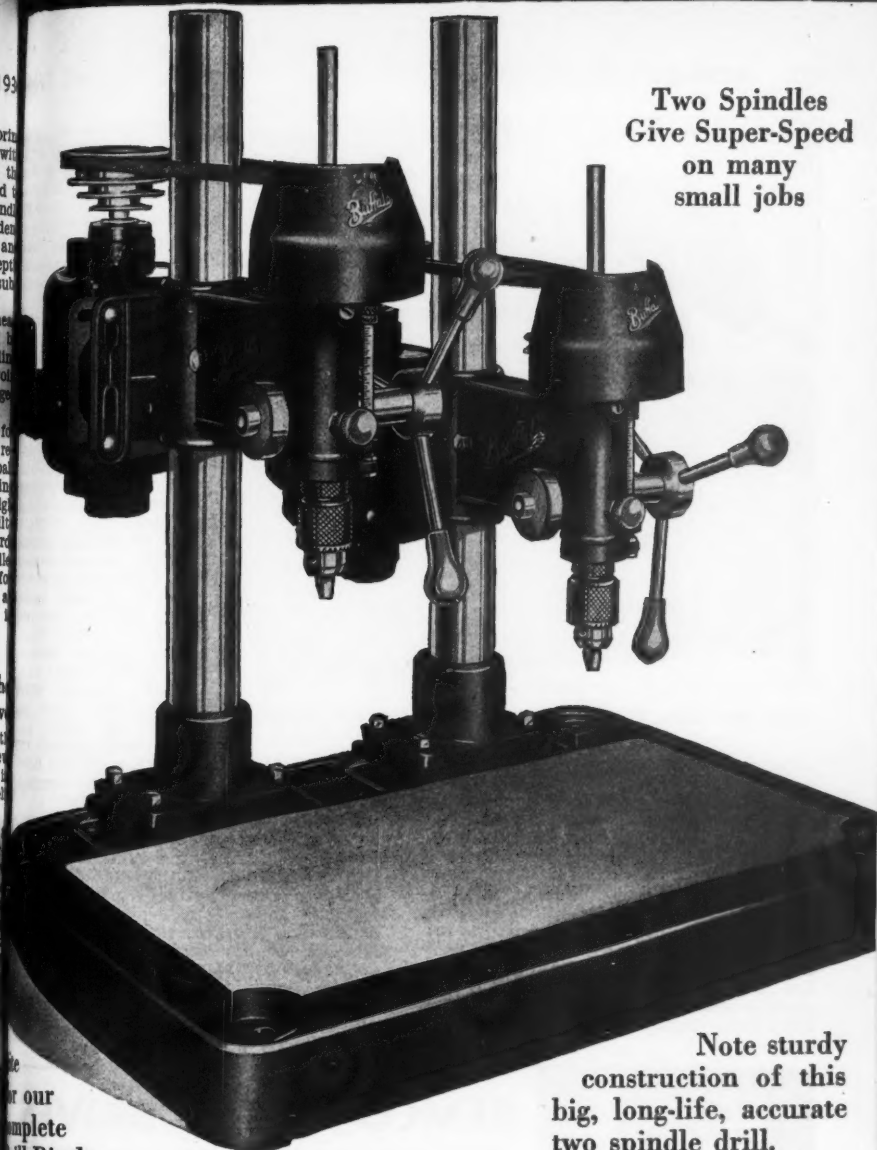
388 Broadway

In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

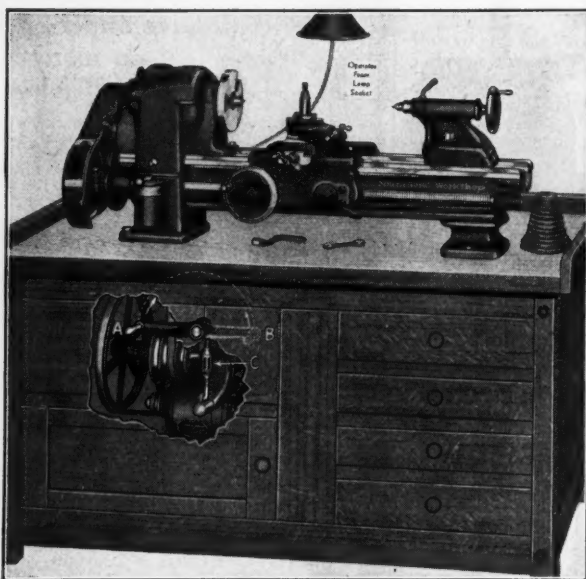
Buffalo, N. Y.

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Two Spindles
Give Super-Speed
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small jobs



Note sturdy
construction of this
big, long-life, accurate
two spindle drill.



South Bend 9-In. Workshop Lathe With Underneath Belt Motor Drive

adjustment in the tension of the spindle belt can be secured by a turnbuckle attached from the crankhandle to an arm of the countershaft. A hinged cover encloses the headstock which can be raised upward when desiring to shift the cone pulley belt.

This new lathe is available in either the flat belt or the V-belt style. The former has a three cone headstock providing six spindle speeds which range from 39 to 630 r.p.m. The V-belt style has a four cone headstock with eight spindle speeds which range from 44 to 585 r.p.m. Both cut screw threads from

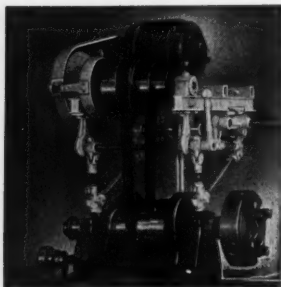
4 to 40 per in., and with a fine screw thread cutting attachment the number is increased to 80 threads per inch.

Several new features of the adjustable type underneath motor drive include: Down drive to the lathe spindle, insuring a powerful, silent and efficient drive; completely enclosed mechanism with no moving parts exposed; screw type belt tension adjustment for any desired pulling power; belt tension release for shifting belt to change spindle speeds; and an absence of overhead obstruction to impair vision. In addition, the 1936 Model 9-Inch "Workshop" Lathe features ten new improvements, among which are: Twin gear reverse for right and left hand threads and

feeds, a ball thrust bearing on the headstock spindle, larger spindle bearings, and felt shear wipers on saddle.

The bed and bench legs of this style lathe are a one-piece casting of 50 per cent steel and 50 per cent nickel iron. Bed lengths are offered in 3-ft., 3½-ft., and 4-ft. Each 9-In. "Workshop" Lathe bed has three V-ways and one flat way accurately planned, seasoned and hand-scraped, so that headstock, tailstock and carriage are in accurate alignment to within limits of 0.001 in.

The headstock casting is reinforced and webbed, giving it strength and rig-



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Complete rigidity—no overhang—no strain on beds, frames, etc. Universal motor mounting—use any motor—not built special, change from one tool to another if desired. V Belt or Chain from motor. Complete guards—quick belt adjustment. Complete line of Drives from Hack Saws to 42" Lathes, etc.—Quickly applied.

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YORK, PENNSYLVANIA

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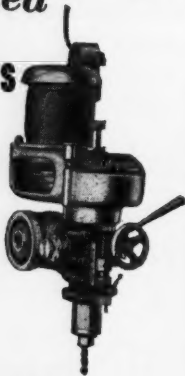
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idity, and its base is machined and handscraped to accurately fit the lathe bed. It is aligned by the inside V-way and inside flat way, and permanently held in place by a strong, substantial clamp.

Hardinge "Cataract" Precision Ball Bearing Bench Lathe

Designed especially to facilitate precision work in the production, tool room and laboratory departments is the Hardinge "Cataract" Precision Ball Bearing Bench Lathe now being marketed by Hardinge Brothers, Inc., Elmira, N. Y. The machine is designed to provide for the proper cutting speeds for all sizes of work from the smallest to the maximum capacity of the machine. In designing the machine, the engineers have taken into consideration the requirements for the use of tungsten carbide and diamond tools. Super precision duplex preloaded ball bearings provide extreme accuracy and high spindle speeds while requiring no adjustment. The ball bearings are fully sealed to retain oil and exclude foreign matter.

The headstock frame is of the finest grade of seasoned and heat treated alloy iron. The bearing surface is hand



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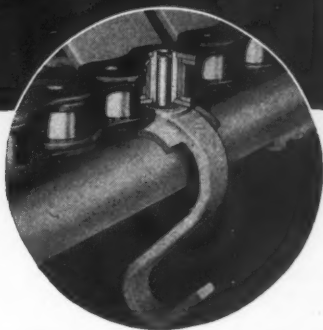
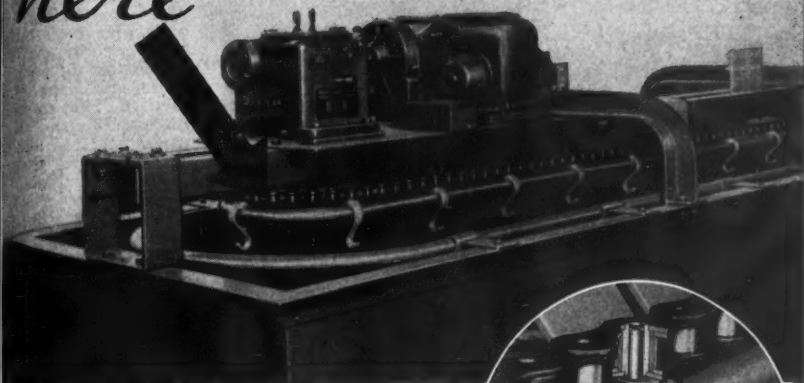
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When you have an unusual conveying job—think of Baldwin-Duckworth roller chain. Special attachments as in the case illustrated here, may give you just what you want.

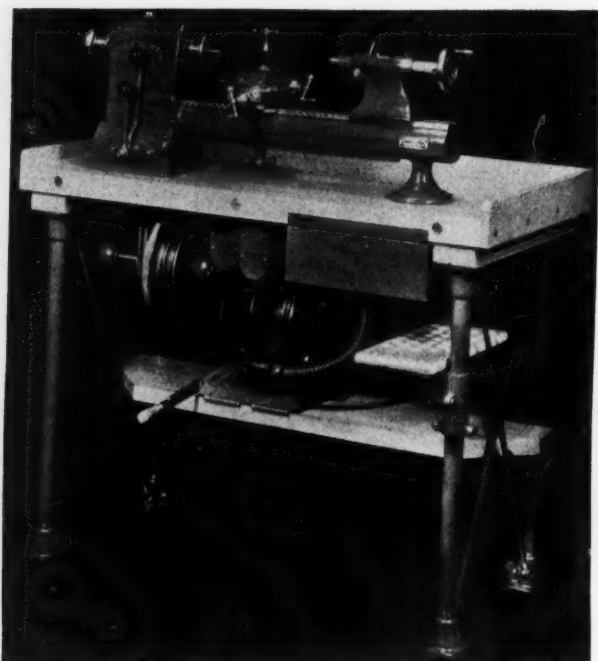
The uses of roller chain are practically universal—wherever power is to be transmitted—or conveying to be done—Baldwin-Duckworth can save you money. Trained engineers will advise you without obligation.

Parts are carried through this electrolytic bath by a special hollow pin chain. The hooks can be inserted to any desired intervals. Note the "shoe" on the hook which provides ample electrical contact.

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SPRINGFIELD, MASS.

Factories at Worcester and Springfield, Massachusetts.

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Hardinge "Cataract" Precision Ball Bearing Bench Lathe

scrapped to fit the size of the amply-proportioned lathe bed. The connected bearing, enclosed headstock, is an outstanding feature. The enclosed headstock makes possible a greater accuracy, heavier cuts, higher spindle speeds, and completely encloses the driving belt.

The spindle, which is made of the best grade of ball bearing steel, is hardened and ground both internally and externally. With the ball bearing construction, the spindle is mounted in rotating

control of the lathe by means of a forward-stop-reverse control lever. The brake and brake band are arranged around the spindle pulley.

The lathe is available with either of two modern electrical driving units. One unit has a range of six speeds forward and six reverse from 230 r.p.m. to 2500 r.p.m. and the other has eight speeds forward and eight reverse from 230 r.p.m. to 2900 r.p.m. This range of speeds is obtained without the use of gears,

members to eliminate wear. The spindle has the Hardinge patent taper nose; a threaded nose spindle will be furnished upon application.

Ball bearings are preloaded, the pressure between the balls and races being such as to prevent formation of an oil film; thus the contact of load-carrying members is positively metal and the load is carried on perfect spheres of hardened steel instead of globules of oil whose load-carrying ability varies with the operating temperature. The preloading is calculated accurately.

Each bearing section receives oil through cups located at the rear of the headstock. Both bearing sections are sealed to exclude dirt and foreign matter. A mechanical brake, mounted inside the enclosed headstock, provides immediate

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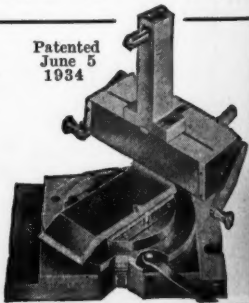
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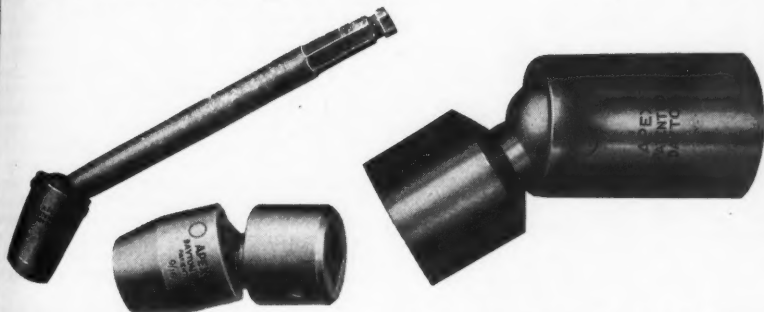
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Also furnished with square and Oval Shank openings to fit all kinds of Extension Shanks.

Apex Universal Joint Socket Wrenches will reduce your assembly costs.

Ends can be bored for connection to your shafts, or may be machined with square

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Used in hundreds of plants for all kinds of angular drives and controls. Also used on aircraft for fuel cock controls, stabilizer controls, starter cranks and retractable landing gear.

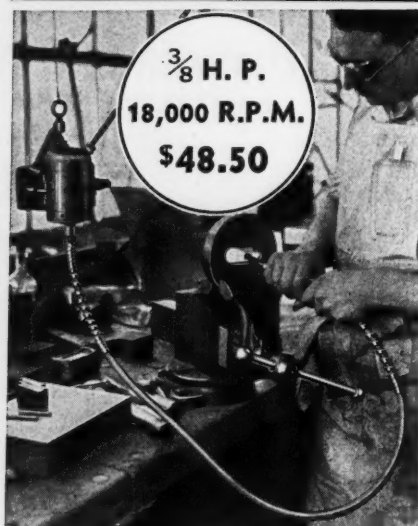
Also manufacturers of Safety Friction and Positive Drive Tapping Chucks, Vertical Float Tapping Chucks and Tap Collets. Full Floating and Semi Floating Tool Holders, Self-Releasing Stud Setters, Plain Socket Wrenches, Screw Drivers, Apex S. & H. Adjustable Machine and Shell Reamers and Expansion Reamers.

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STANLEY FLEXIBLE SHAFT GRINDER



This handy, powerful grinder is ideal for grinding operations on tools, dies, moulds, small castings, etc.

Powerful Universal Motor will maintain high grinding speed on the toughest work. The 42" rubber covered flexible shaft is of the finest quality; handle piece is equipped with high speed ball bearings and a collet type chuck for $\frac{1}{4}$ " shanks. Accessories, including arbors, pencil-wheels and emery wheels, can be supplied.

Complete Equipment Includes

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- 2 Wrenches

STANLEY ELECTRIC TOOL DIVISION
The Stanley Works
137 Elm Street, New Britain, Conn.

clutches or loose pulleys. A wide variety of attachments are available for use with this lathe.

The lathe is available with capacities through the collet and draw spindle of $\frac{1}{2}$, $\frac{3}{4}$ or 1 in. and with swing over the bed of wither 7 or 9 in. Length of bed is 36 in. in all cases. Weight ranges from 162 to 186 pounds.

Ex-Cell-O No. 46 Carbide Tool Grinder

The Ex-Cell-O Aircraft & Tool Corporation, Detroit, Michigan, has brought out the No. 46 Carbide Tool Grinder illustrated herewith. The machine is designed for rapid, economical grinding and lapping of single point cemented carbide tipped turning, facing and boring tools. Diamond wheels, silicon carbide vitrified cup wheels or diamond lapping discs can be used on this machine. The machine is designed for three different methods of grinding a roughing and finishing cut can be taken with two silicon carbide cup wheels; roughing with silicon carbide cup wheel and finishing with diamond wheel; or roughing with silicon carbide vitrified cup wheel and lapping with a diamond lapping disc.

Tools up to $\frac{5}{8}$ -in. square shank can be rough and finish ground with silicon carbide vitrified wheels. When grinding with diamond wheels or lapping with the lapping disc, larger size tools can be handled.

The grinder is of the double-end type, equipped with either commercial ball bearings or with Ex-Cell-O Precision Bearings, and driven by a "V" belt from an electric motor mounted in the base of the machine. An adjustable tool support table with a hardened and ground

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BLOWS powerful 275 M.P.H. blast of air into motors and machines. Drives out dust and dirt. Prevents fire, friction, burnouts and shut-downs. **VACUUM** cleans stock bins, shelves, overhead pipes, walls, rugs, etc. **SPRAYS** insecticides. 1 H.P. motor. Most powerful blower built — 46 $\frac{1}{4}$ " waterlift.

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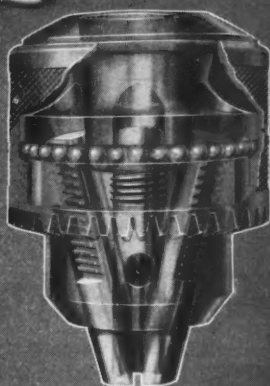
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Only a "Super" chuck. Designed and built to give the super service required at the contact point between modern machines—modern tools. It has precision—power—speed—durability, the four essentials for efficiency on heavy duty production on lathe and drill press. It is the perfect chuck for automatic screw machines. Jaws spin into position smoothly, rapidly on frictionless ball bearings—tool changes are quick and easy. Ground parts—including arbor holes—insure a high degree of accuracy.

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Semi-quick change gear box with gears for cutting 4 to 80 threads per inch.

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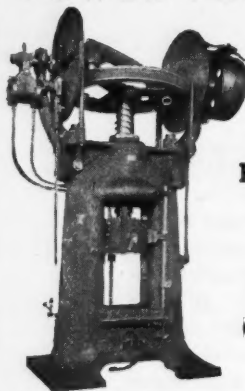
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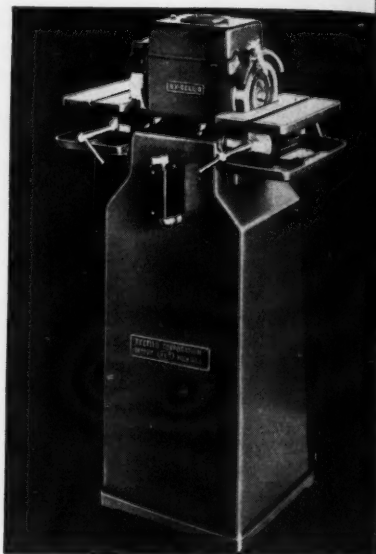
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Newark, N. J.

surface is located at each end of the machine with a two-inch adjustment for wheel wear and to obtain the correct rake and angle on the tools to be sharpened. A slot is provided across the face of each table to guide the tool protractor guide and wheel dresser. Each table is provided with a graduated scale enabling an adjustment of 16 degrees above or below center. The protractor tool guide is adjustable through a full range of 180 degrees.

A coolant reservoir is located in the



Ex-Cell-O No. 46 Carbide Tool Grinder

upper part of the wheel head, providing the necessary coolant for diamond wheel grinding. Needle valves at each end of the reservoir control the gravity feed of the coolant. Suitable safety and splash guards are provided for each wheel.

The machine is designed to use silicon carbide vitrified wheels 6 in. in diameter by 1½ by 1¼ in., recessed 3 in. diameter by 1 in. deep on one side. Steel back abrasive wheels 6 in. in diameter, 1½ in. thick with 1¼ in. wide grinding face on the side, mounted on ½ in. steel back with 1¼ in. hole may also be used. This machine will take diamond wheels 6 in. in diameter by ¾ by 1¼ in. with either ¾ or ¾ in. rim or 3 in. in diameter by ¾ by ½ in.

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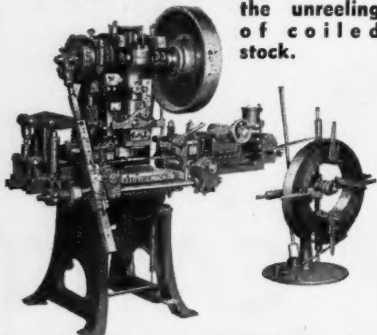
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96 Silliman Avenue Bridgeport, Conn.

with $\frac{3}{8}$ in. rim.

A one-third horsepower, 1800 r.p.m. 220 volt, three phase, 60 cycle open frame sleeve bearing motor is used in driving the spindle. Machine can also be furnished for single 110 volt, two or three phase, 220 or 440 volt alternating current, or 115 or 230 volt direct current. A drum type switch is mounted on the front of the machine for starting, stopping and reversing the direction of rotation of the motor for grinding right and left hand tools.

Hevi Duty "Alloy" High Temperature Muffle Furnace

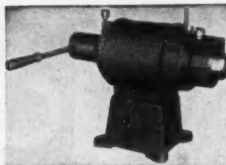
A muffle furnace designed for use in laboratory operations requiring temperatures to 2400 deg. F., identified as the "Alloy 10", has been placed on the market by Hevi Duty Electric Co., 421 W. Highland Blvd., Milwaukee, Wis. The furnace is especially intended for the drying of precipitates, ash determinations, fusions, ignitions, heating metals and alloys, enameling and enamel melting, ceramic firing, and for experimental test work.

The safe working temperature of the "Alloy 10" Muffle Furnace is 2350 deg. F. (1288 deg. C.). For intermittent periods of comparatively short duration, the furnaces may be operated at a maximum temperature of 2400 deg. F. (1315 deg. C.). Standard furnaces, operating on standard voltages, will attain a temperature of 2000 deg. F. (1093 deg. C.) in approximately 85 minutes and 2300 deg. F. (1260 deg. C.) in approximately 120 minutes.

The shell of the furnace is of sheet steel, finished in a special laboratory gray and mounted on cast iron legs. A metal shelf beneath the furnace body offers a convenient place for holding tongs, crucibles, and so on. The insul-

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WHO KNOW THINGS
THAT MAY HELP YOU
modernize assemblies



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A few words will tell you what it would mean to invite one of these Parker-Kalon Assembly Engineers to go over your fastening jobs with you:

First, these men are not salesmen, and their services will not obligate you.

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Third, they do know more about one of the most important ways to modernize assembly work than any general assembly man could know. This knowledge will be placed at your disposal. The Parker-Kalon Assembly Engineer will study your fastening jobs with you, and use his specialized knowledge of the famous Parker-Kalon Hardened Self-

tapping Screws to help you locate any practical possibilities for applying them to reduce costs, save operations, simplify design, and strengthen metal and plastic fastenings.

Fourth and most important, there is a 7 to 10 chance that you will uncover economies and benefits which can be obtained without added expense or radical changes. That average has held in hundreds of cases, including some of the largest plants. And it is significant that usually the plant executives "knew about" Self-tapping Screws, but invited a Parker-Kalon Assembly Engineer in to make sure that they were getting all possible benefits.

Wouldn't it pay you to use the knowledge of one of these six men? If you'll write, we will schedule a visit with you for the Engineer in your territory.

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PARKER-KALON *Modern* FASTENING DEVICES

A HARDENED SELF-TAPPING SCREW FOR EVERY KIND OF ASSEMBLY



Hevi Duty "Alloy 10" High Temperature Muffle Furnace

ation in the furnace consists of three courses of high quality preformed slabs

and light weight high temperature insulating bricks. The material used in each course is designed and selected for its high thermal efficiency at the temperature to which it is subjected.

The furnace contains four heating units, each consisting of a heating coil supported in grooves of a refractory plate. All refractory plates may be reversed either to expose the heating coils to the furnace chamber or to muffle them. The top and bottom are interchangeable, likewise the two side units. The door is of cast iron and is insulated with a lightweight high temperature insulating brick. The front head of the furnace is a cast iron plate, ribbed to prevent warpage and provided with a cast shelf. The rear head containing the electrical connections, is of asbestos board. A fire-brick vestibule, together with concentration of heating elements near the vestibule tends to eliminate the cold zone found at the front of the heating chamber in many furnaces.

The furnace is built in three types

1905

Strand

1936

FLEXIBLE SHAFTS and MACHINES

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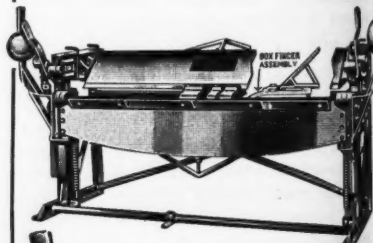
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No. 8 Imperial
Punch

Whitney Metal Tool Co.

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The "PIGMY" HOIST WITH A GIANT'S POWER

For The Metalworking Industry
THE

PUL-LIFT

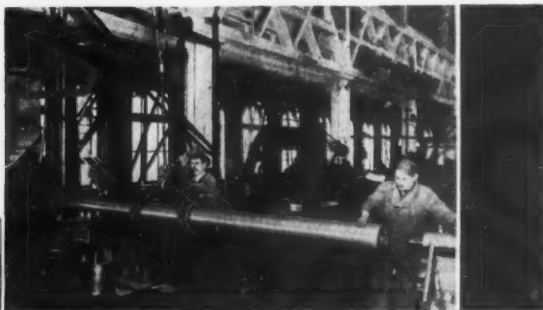
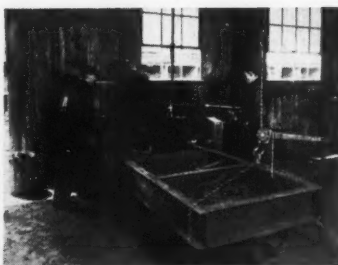
The PUL-LIFT is small and light enough to easily be carried about by one man, yet its power and durability are amazing—and it is a real glutton for work. It both pulls and lifts—operates either in horizontal or vertical position.

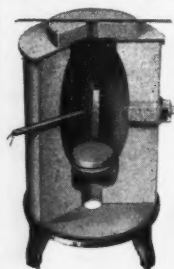
This remarkable device is appropriately called "the tool of 1000 uses." It is made in 4 sizes— $\frac{3}{4}$, $1\frac{1}{2}$, 3 and 6 tons capacities.

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Heat straight carbon, Hi-Carbon—Hi-Chrome and High Speed steels entirely by radiation . . . without danger of pitting or oxidation. High speed heat in less time and at lower cost. Guaranteed and sold on 30 days trial.

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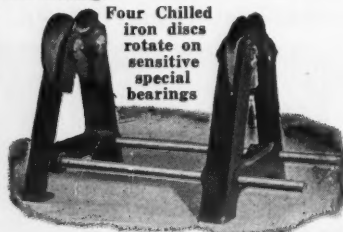
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Ways**

**No Leveling
Required**

A simple and excellent device for balancing straightening and truing.

They are made in the following sizes:

| Swing | Greatest Distance Between Standards | Capacity in lbs. |
|--------|-------------------------------------|------------------|
| 20 in. | 20 in. | 1,000 |
| 40 in. | 30 in. | 2,000 |
| 60 in. | 30 in. | 2,000 |
| 72 in. | 66 in. | 5,000 |
| 96 in. | 88 in. | 10,000 |



Four Chilled iron discs rotate on sensitive special bearings

Write for Full Information

Mfd. By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee St., Rockford, Ill.

and six sizes, measuring from $4\frac{1}{2}$ in. wide by $3\frac{1}{2}$ in. high by $10\frac{1}{2}$ in. deep to $23\frac{1}{2}$ in. wide by 30 in. high by 31 in. deep, and weighing from 190 lb. to 430 lb. without rheostat.

Harnischfeger 75-Amp. Vertical Welder

The outstanding feature of the 75-ampere vertical welder announced by



Harnischfeger 75-Amp. Welder

Harnischfeger Corporation, 4535 W. National Ave., Milwaukee, Wis., is the extremely stable high speed arc which is accomplished through combining the magnetic bridge as a part of the main pole assembly and spreading the pole shoes wider around the holes in which

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For Factory & Shop

Sturdy ALL-STEEL construction, well braced and welded thruout. Painted Moss Green. Height Overall 26". Top and bottom rail punched to take a 12" plank. Also special built bench legs.

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AS SHOWN
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LATHES**



Self-contained countershaft and universal motor bracket. Threading range 4 to 96 per inch. 16 speeds 28 to 2072 R.P.M. Auto. matic reversible power feeds. Threading dial. Graduated tailstock ram. Modern V-Belt drive. New heavy cast iron gear guard. Threading chart. Laminated shims throughout. Heavy, new design compound rest. Well and pin for center lubricant.

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Complete displays at: Chicago-35 E. Wacker Dr. New York-130 W. 42nd St. Philadelphia-113 N. 3rd St.

The new Atlas lathes were designed and built to give more value—accuracy—efficiency and satisfaction than ever before during the 25 years Atlas has been building precision shop equipment. The back-gear model shown has 36" bed, 10 1/4" swing, and takes 18" between centers. Accurate to .001" for those precision jobs in manufacturing, tool room, or laboratory. Can be fitted with attachments for all machine shop operations.

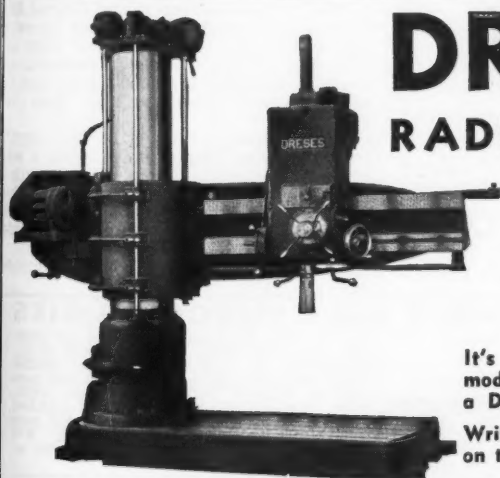
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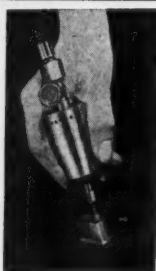


It's a paying investment to modernize your plant now with a DRESSES RADIAL DRILL.

Write today for full information on these advanced tools.

THE DRESSES MACHINE TOOL CO.

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THE M-B SUPER SPEED AIR GRINDER

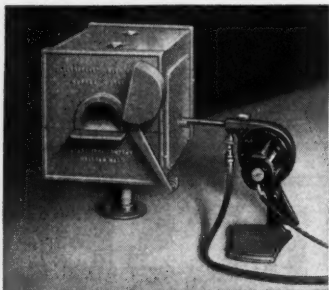
Has an amazing speed of 100,000 R.P.M. Small-Light-Compact. Just the tool for getting into small, difficult places. Write for particulars. Good opportunity for Dealers.

M-B PRODUCTS
General Sales Office, 130 E. Larned St., Detroit, Mich. Factory, Aigonac, Mich.

"Stark"

"ELECTROBLAST"

High Speed Heat in 20 Minutes



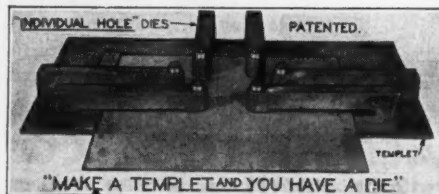
Powerful torch used separately as a very handy portable flame, \$35. High Speed Muffle Furnace, no scaling or decarburization, reaches high speed heat in 20 minutes at 7c per hour; quickly saves its cost. Muffle 7"x3 1/2"x2 1/8", \$35. Also a large furnace with built-in torch, muffle 7"x4 1/2"x3 1/8".

STARK TOOL CO.

Originators of the American Bench Lathe
Est. 1862 WALTHAM, MASS.

WALES ADJUSTABLE HOLE PUNCHING DIES

NEVER BECOME OBSOLETE. When you change models you reset them to make the new parts.



Small runs are made on BENCH set-up, holes in straight lines on PRESS BRAKES, and holes scattered over parts on PUNCH PRESSES. These "INDIVIDUAL HOLE" dies are self contained with the punch and die in the same holder, thus eliminating die setting. Will punch 1/8" holes in 14 gauge steel or under.

Write for detailed booklet.

The Strippit Corporation

1559 Niagara St.

Buffalo, N. Y.

the stabilizer coils are imbedded. Service tests and oscillograph recordings are said to show that this change in generator design has resulted in a greater degree of current uniformity.

Mounted atop the generator of this model is a heavy duty 5 h.p. squirrel cage motor of drip-proof construction. This fan-cooled motor is operated by push buttons and is equipped with no-voltage release and overload protection. Connections are available for 110 to 550 volts or for special voltages of 2 and 3 phase 60 and 50 cycle current. Single control is provided for current settings over the entire welding range to reduce dependence upon the human element.

The unit will handle work as light as 24 gauge, which is sufficient to meet the demands for welding metal furniture, furnaces, kitchen utensils, steel sash, and so on, since it produces uniformly strong welds even with stainless steel and non-ferrous alloys. The unit is 15 1/2 in. in diameter, 41 in. high and weighs 600 lbs. It is supplied with stationary or wheel truck mountings or with lifting ball.

Onsrud MD-1 Turbine Grinder

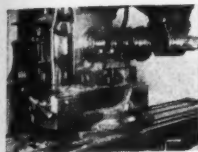
To meet the need for a small high speed grinder for use in the making of dies and for grinding small threading dies and similar tools, the Onsrud Machine Works, Inc., 3900 Palmer St., Chicago, Ill., has developed the Onsrud MD-1 Turbine Grinder illustrated herewith. Operating with air from the shop air-line, the spindle of this grinder will operate at a speed of 50,000 r.p.m., and the complete tool weighs less than two pounds.

The turbine motor is of the impulse reaction type, single stage, with a solid milled rotor. The nickel steel spindle is 16 mm. diameter, chambered for oiling. Bearings are open type with Textol retainers. The tool is lubricated by automatic centrifugal force oil feed.

The overall dimensions of the grinder



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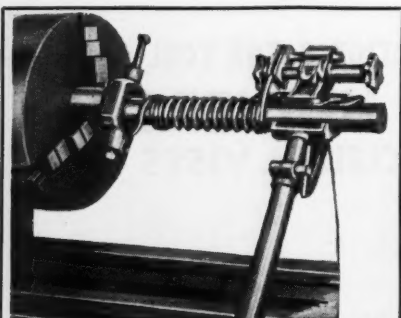


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CYLINDRICAL SUB-PRESSES



ARON TYPE

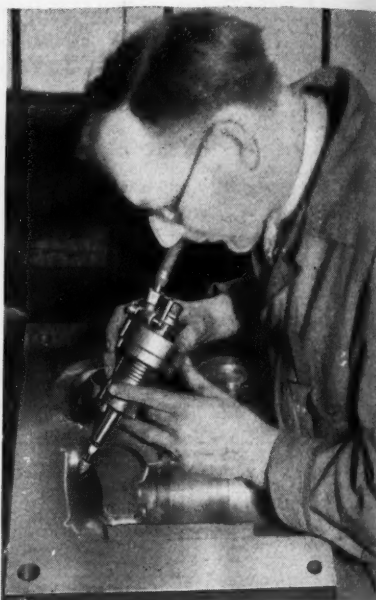
Waltham Machine Works

WALTHAM, MASS.

May be adjusted for wear and so perfect alignment can be maintained. This means that the quality of the punchings will not vary and that the life of the dies is increased. Nine diameters of plungers in arch and overhang types in stock. Ask for booklet on Sub-Presses and Dies.

are $3 \frac{3}{16} \times 7 \frac{5}{8}$ in. and the spindle projection is $2 \frac{5}{16}$ in. from the housing with a $\frac{5}{16}$ in. of projection available. The weight is 1 lb., 15 ounces. The tool is intended to work on an air pressure of 90 to 100 lbs., consuming 8 cu. ft. of air per minute.

For close work in die recesses or for grinding small holes, the 50,000 r.p.m.



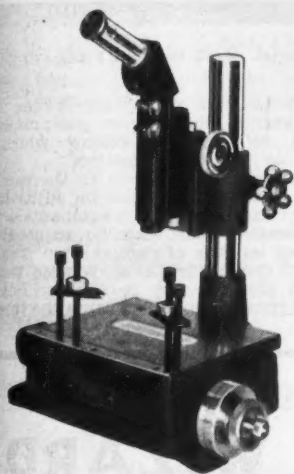
Onsrud MD-1 Turbine Grinder

of the spindle makes possible the use of small wheels to their maximum efficiency. Fixtures and mountings can be provided for most standard makes of internal grinders or for engine lathes. When used for drilling, small hand drills are driven at their correct speeds.

The Onsrud MD-1 Turbine Grinder is supplied in a case with the following equipment: 10-ft. hose with couplings, one tool post holder, two wrenches, one pressure feed oil can, one $\frac{1}{8}$ -in. bushing, one $\frac{1}{4} \times \frac{3}{4}$ -in. four-flute end mill, one $\frac{1}{4}$ -in. arbor with $\frac{1}{2}$ -in. wheel, one $\frac{1}{4}$ -in. mounted wheel with $\frac{1}{4}$ -in. arbor, one $\frac{5}{8}$ -in. round mounted wheel on $\frac{1}{4}$ -in. arbor, one $\frac{1}{4} \times \frac{3}{4}$ -in. conical mounted wheel with $\frac{1}{4}$ -in. arbor and one $\frac{1}{2}$ -in. diameter bell shaped mounted wheel with $\frac{1}{8}$ -in. arbor.

Gaertner No. M-1190 Measuring Microscope

A measuring microscope especially adapted for toolroom and laboratory work, illustrated herewith, has been brought out by the Gaertner Scientific Corporation, 1201 Wrightwood Ave., Chicago, Ill. The range of the instrument is 2½ in. The micrometer screw with nut is housed in the 8x9-in. normalized semi-steel base, which is also fitted with guides for the stage. The stage, which is 5x6.5 in., travels on steel balls and



Gaertner No. M-1190 Measuring Microscope

is equipped with a heavy glass insert. A 4-volt incandescent lamp provides illumination from below. Four clamps are furnished for clamping objects up to 1¾-in. thick. Work up to 6 in. high can be accommodated.

The micrometer screw is of specially selected steel, and is fitted with a head 2 in. in diameter, with 50 divisions. The vernier reads to 0.0001 in., a scale on the base indicating full revolutions of the screw.

With the adjustable draw tube, the microscope gives magnifications from 16 to 35 diameters. Two objectives and a Ramsden eyepiece are standard equipment. The cross hairs are etched on glass. Rack and pinion with two large knurled heads provide for smooth focusing. Observations are comfortably made through the inclined eyepiece, which

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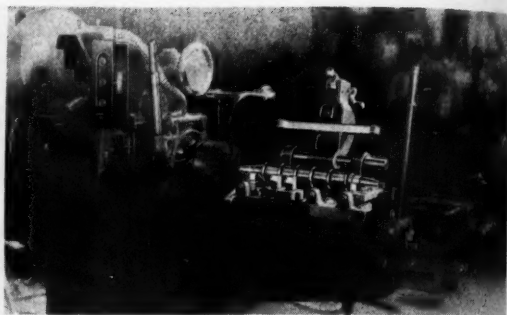
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SPECIALIZED INDUSTRIAL CLEANING MATERIALS & METHODS

shows objects in their normal aspect and motion. A certificate of accuracy is supplied. The instrument is fitted with a rubberoid cover and hardwood carrying case.

Landis Special Work-Holding Fixture

A work holding fixture designed to maintain concentricity between both ends of a threaded part has been placed on the market by the Landis Machine Company, Waynesboro, Pa., for use on its threading machines.

The accompanying photograph shows this fixture applied to a Landis Single Head Leadscrew Motor Driven Threading Machine as used for threading both ends of a diesel engine cam shaft. A $\frac{3}{8}$ -in. hardened and ground Lanco head is used for cutting the threads. In this case especially close tolerances were placed on the concentricity of the two ends. To insure this concentricity the cam shaft is held in "V" grips made of hardened steel and gripped on the bear-



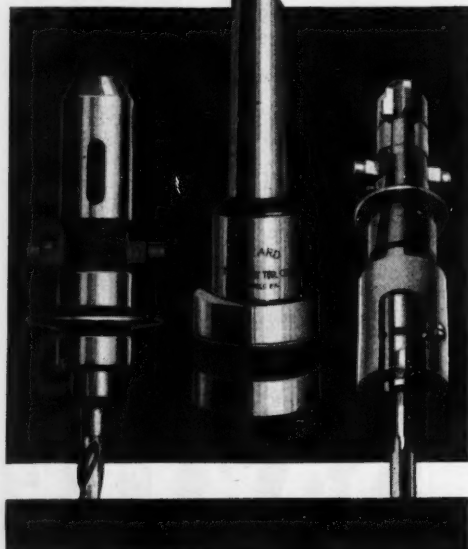
Landis Special Work-Holding Fixture

ing surfaces at each end of the cam shaft and is clamped in position by a special self-aligning clamp which is shown in the open position.

The fixture is attached to the carriage of the machine and can be adjusted to obtain the required alignments. The rear locating plate can be adjusted for different lengths of cam shafts. The design of the fixture is so flexible that it can be adapted very readily for holding other types of work requiring the thread-

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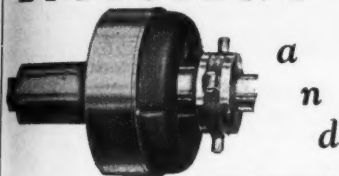
Time-out for changing tools eliminated. Blind holes tapped at full speed with complete safety.

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Holes Perfectly
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Tremendous Speeds



Higher speeds and greater production are possible with this high speed friction tapper. Double-cone clutch, ball bearings, balanced reversing mechanism. Sturdy, sensitive, economical.

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No. 6-E Constant Speed Blower
Note substantial construction

for Blowing Jobs . . .

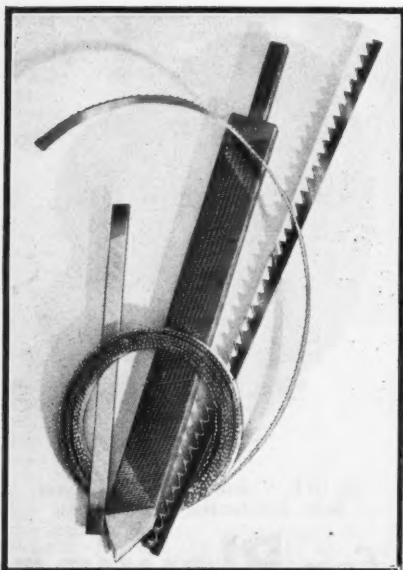
For blast to oil and gas furnaces—for cupola blowing—for all jobs where you need air pressures up to a pound and capacities up to 7000 c.f.m.—there's a Buffalo "E" Blower of the right size to fit your requirements! Sturdy cast iron casings, heavy-duty, high efficiency rotors combine to make these the most popular blowers for this work. Also available with flanged inlet and outlet for gas booster service.

WRITE for bulletin 2386 giving ratings, and ask for prices on fans to fit your requirements.

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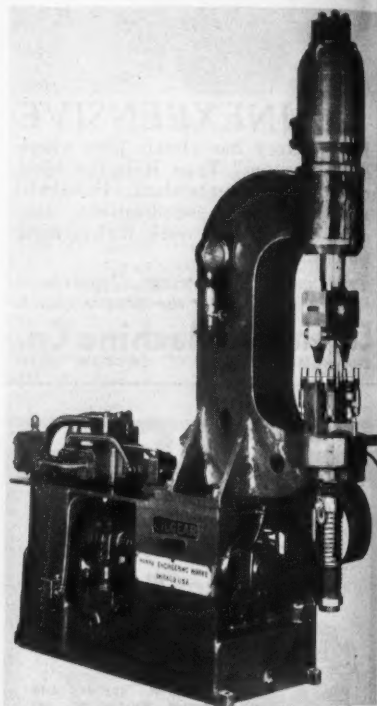
MARBURG BROS. INC.

88 West St. New York, N. Y.

ing of both ends in true alignment and can be furnished for any size Landis threading machine.

Hanna Electric Hydraulic Riveter

The Hanna Electric Hydraulic Riveter illustrated herewith has been designed by Hanna Engineering Works, 1769 Easton Ave., Chicago, Ill., to meet the need for an efficient, self-contained riveting ma-



Hanna Electric Hydraulic Riveter

chine embodying flexibility of speed and load ratio, cushioned application of forces and ability to take peak loads smoothly and without damage to the mechanism.

The riveter as illustrated is equipped with an Oilgear Fluid Power Pump direct-driven by an electric motor through a flexible coupling. The pump, motor, valves, and circuits are mounted on a rigid combination base and oil-pot.

Initial work or closing movements are performed at high speed and low pres-

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The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout, equipped with ALEMITE LUBRICATION, complete with grease gun.

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Not a motor-grinder-stand, but a COMPLETE PRECISION GRINDER for ALL sizes of small drills, $\frac{3}{32}$ " to $\frac{1}{2}$ ".

Grinds an improved OLIVER drill point, quickly and accurately.

Our improved method of holding and setting the drill insures perfect drill points and 100% satisfaction and drill performance.

Can be had for grinding right or left hand drills, or both; Oil hole drills, countersinks, etc.

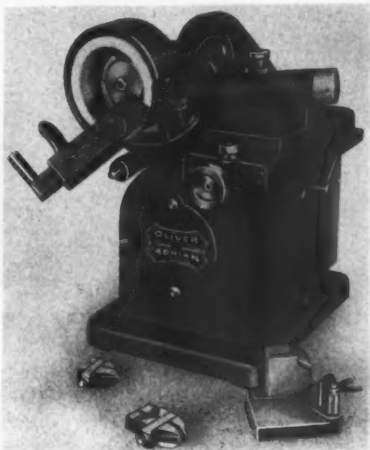
Install one or more in your tool crib and note the increase in production; savings in drill purchases; reduction in spoiled work; etc.

A superior drill grinder at a price within the range of every shop, large or small.

OLIVER INSTRUMENT CO.

1430 E. Maumee St.

Adrian, Michigan



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sure. Maximum pressures may be regulated to the work, thus holding power consumption to a minimum and avoiding distortion of the work by reason of excess tonnage. At the maximum pressure of 3,000 lb. per sq. in., the riveter exerts a pressure of 80 tons on the dies. It is also available in capacities of 20, 40, and 60 tons. The reach and gap may be varied to suit the work.

Ruthman Model 11020A Gusher Pump

The Ruthman Model 11020A Gusher Pump, made by Ruthman Machinery Co., 536 E. Front St., Cincinnati, Ohio, is designed for simplified installation, the pump being installed by attaching with four cap screws to a pad on the side of the reservoir. The discharge pipe is internally connected and is contained within the intake.

This pump needs no priming and has twin intakes of equal size, providing hydrostatic band of the impeller and motor shaft. There are no close tolerances or metal-to-metal contacts. An all-centrifugal seal is a feature of the pump, requiring no packing. The result

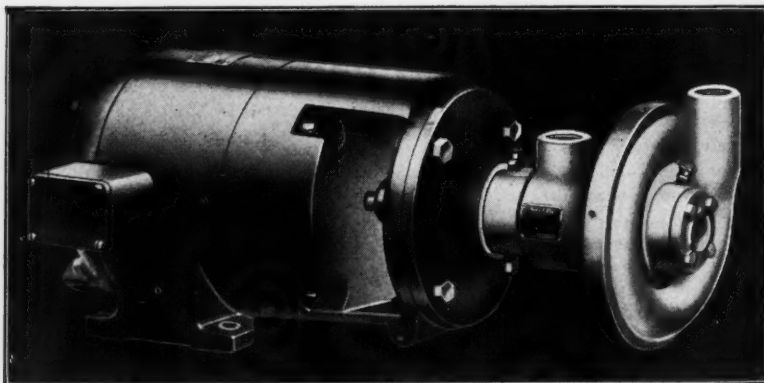
is that the pump mechanism is unharmed by chips or abrasives.

The pump is automatically cleaned when the discharge flow is throttled. Positive gravity priming insures instantaneous flow. An outstanding feature of the Model 11020A is the elimination of piping around the exterior of the machine, avoiding the necessity of drilling extra holes in the reservoir.



11020A Gusher Pump
Ruthman Model

The pump is of typical Ruthman design and construction, being of the vertical type, equipped with ball bearings and powered by a self-contained motor. Simplicity, elimination of extra wearing parts and valves, and steady, high volume with low pressure are combined to deliver the maximum in pump-



The "Spiral-Flo" PUMP—DIRECTLY CONNECTED TO BELL TYPE MOUNTING MOTOR.

Pumps oil or water or any combination of the two. Operation is not effected by coolant impregnated with chips. Capacities $2\frac{1}{2}$ to 52 G.P.M. Send for Bulletin.

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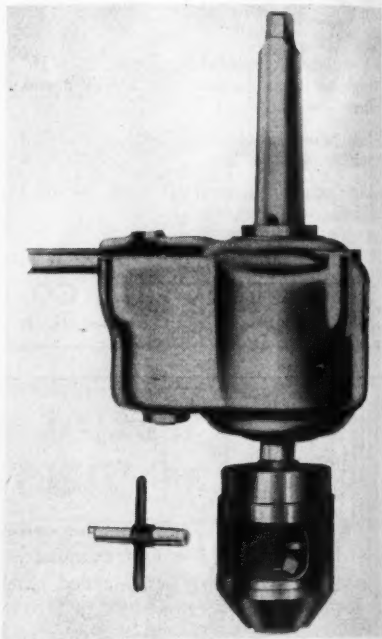
Oliver Instrument Co.

1430 E. Maumee St.,
Adrian, Michigan

ing efficiency at the minimum of power cost. The pump requires no packing, no felt washers, and no depending close fits of any part coming into contact with the grinding compound. An intake strainer prevents injury to the impeller.

Wahlstrom Full-Automatic Tapper

Power and sensitivity are outstanding features of the Wahlstrom Full-Automatic Tapper, the newest addition to the line of drill chucks and tap holders



Wahlstrom Full-Automatic Tapper

made by Wahlstrom Tool Division, American Machine & Foundry Co., 5522 Second Ave., Brooklyn, N. Y. The Wahlstrom Full-Automatic Tapper is so designed that in operation the motion of the tap is always forward, yet at the slightest upward movement of the drill press handle the tapper immediately reverses.

The tapper is highly sensitive and smooth operating. When driving a tap, the power increases with the increase of pressure on the handle of the machine. It is said to be as smooth-operating and sensitive on the smallest tap as on the

of power
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intake
impeller.

Tapper
standing
all-Auto-
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The ULTROPAK Measuring Microscope

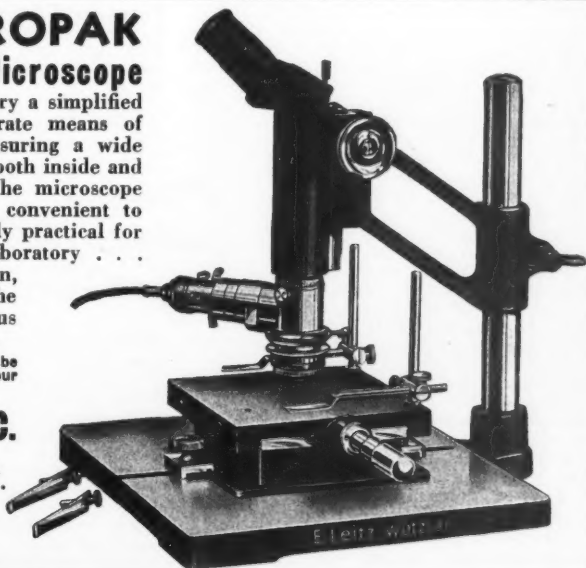
... brings to industry a simplified yet extremely accurate means of examining and measuring a wide range of objects on both inside and outside surfaces. The microscope is comfortable and convenient to use ... is thoroughly practical for shop as well as laboratory ... and in construction, matches any of the other world famous LEITZ instruments.

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SENECA FALLS AUTOMATIC WORK DRIVER

Self Centering . . . Quick Acting . . . No Slip. Attaches to any chuck plate or spindle. Provides a slip-proof, balanced drive reducing chatter. Handles rough forgings or turned pieces — straight or taper. Eliminates dogging time. Reduces tool breakage.

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322 Falls Street
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largest tap within its range.

The unique positive safety drive clutch arrangement is said to practically eliminate the possibility of tool breakage, due to the fact that the tap is instantly thrown out of motion when a hole becomes clogged or the bottom of a blind hole is reached, while the spindle continues to revolve, ready to resume operation. While reversing the tap at the slightest upward pressure on the handle, the reversible clutch forces the tap to revolve in the forward direction the instant it is released from the hole.

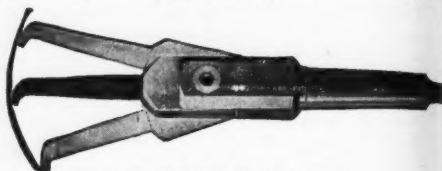
The compact design of the Wahlstrom Tapper permits the maximum of clearance between the tap and the drill table, and the speed with which the tapper can be operated is limited only by the ability of the operator and the resistance of the material. With the new Wahlstrom tap holder chuck a tap can be chucked in a few seconds, with the assurance that the tap will run true. The tapper is available with either No. 2, 3, or 4 Morse Taper Shank.

Maxwell E-Z Set Boring Tool

An adjustable boring tool, the adjustment of which is controlled through the

operation of a worm, is now being marketed by F. A. Maxwell Company, Bedford, Ohio. The boring tool is compact and rigid, and the finest adjustment required can be obtained by revolving the worm.

The bar is made in three sizes. With standard length bits, the No. 0 will bore up to approximately a 3-in. hole; the



Maxwell E-Z Set Boring Tool

No. 1 will bore a hole to approximately 6-in. diameter, and the No. 2 to 9-in. The E-Z Set Boring Tool is equally adaptable to production or jig and fixture work on the milling machine, horizontal boring mill, jig boring machine, radial drill, lathe, or other machine. The shank of the tool screws into the body, therefore the tool is quickly adapted to any machine by having the proper size shank.

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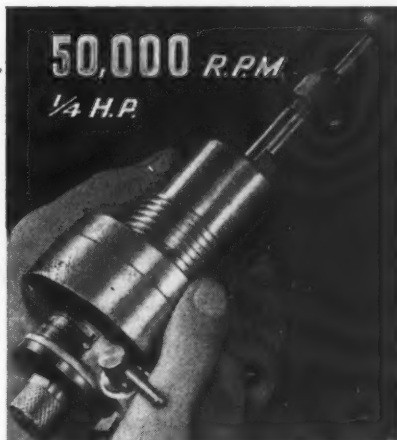


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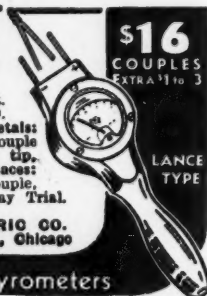
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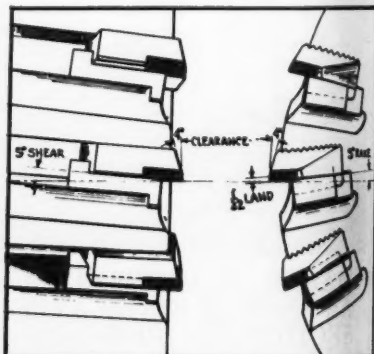
Ingersoll Cemented Carbide Cutters

Ingersoll Zee Lock Milling Cutters, product of The Ingersoll Milling Machine Company, Rockford, Ill., are now available with cemented carbide-tipped



Ingersoll Zee-Lock Cutter with Cemented Carbide Blades

blades. The use of cemented carbide demands cutters that are strong, rigid, and accurate, and the forged and case hardened alloy steel cutter body used



Drawing Illustrating Cutting Angles of Blades in Ingersoll Zee-Lock Cutter

by Ingersoll meets these specifications admirably. The Zee-shaped wedge securely locks the serrated cutting blade in the cutter housing, the wedge hooking the back of the blade and the front of

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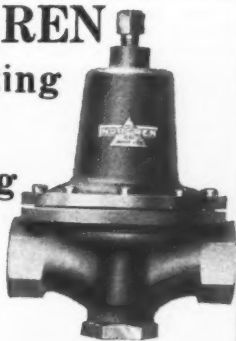


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536 East Front St., Cincinnati, Ohio


the cutter body.

The design of the Zee-Lock cutter is such that it is impossible for the blade to shift backwards or inwards from the cut. The back hook of the wedge is designed on a slant so that when the cutter blade is reinserted and moved out a serration, it automatically moves forward a slight amount, compensating for the face wear. No additional parts or shims are required for resetting.

The blade is adjustable in the proper proportional directions of wear. The wedge is the locking member and is not

disturbed by the thrust of the cut as the thrust is absorbed by the serrations. In reassembling the cutter blade, no stress is placed upon it as the Zee-wedge is so designed that no stress is required.

Ingersoll cemented carbide tipped cutter blades are solidly backed with no blade overhang from the body. The body is generously relieved in front of the blade to provide adequate chip clearance. Correct cutting angles are a feature of Ingersoll Zee-Lock Cutters. Various grades of cemented carbide are available for use on different materials.



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Gauge**
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dial graduated
in 1/1000".
Heavy duty.
Deep throat.
**B. C. Ames
Company**
Waltham, Massachusetts

Forsberg Automatic Screw Driver

The automatic screw driver shown in the illustration has been added to the line of tools produced by The Forsberg Manufacturing Company, Bridgeport, Conn. This screw driver is ball bearing and is of light, strong construction with an extra strong clutch, providing a positive lock for heavy service to drive home screws in the minimum of time. All metal parts are of steel, reducing wear and increasing strength. The handle is



Forsberg Whale Brand Automatic Screw Driver

of mahogany with all exposed parts nickel plated except the bits, which are polished.

The screw driver is made in three lengths as follows: No. W 71; length extended with bit, 16 1/4 in.; closed, 10 1/4 in.; complete with one bit. Each stroke turns screw 4 2/3 times. No. W 81; length extended with bit, 21 in.; closed, 13 1/4 in.; complete with two bits. Each stroke turns screw 5 times. No. W 91; length extended with bit, 24 in.; closed, 15 1/2 in.; complete with three bits. Each stroke turns screw 4 1/2 times.

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This New Catalog Will Help You Select Better End Mills

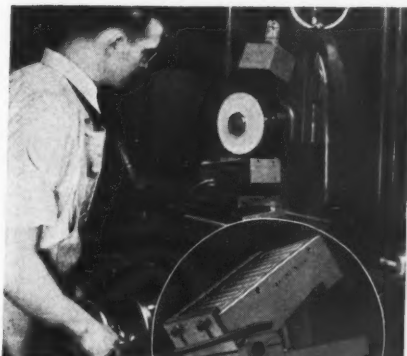
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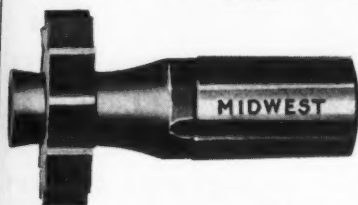
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Designers and Builders of Tools, Gauges, Jigs, Fixtures and Special Machinery

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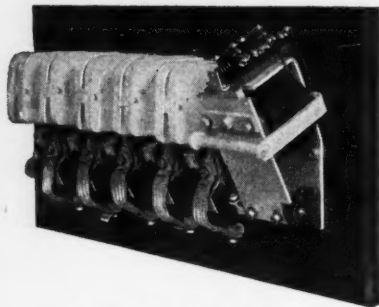
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A new low-voltage alternating current contactor of unique design, which will stay closed through voltage disturbances



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or failure, has been announced by the General Electric Company, Schenectady, N. Y. Instead of utilizing a mechanical latching mechanism, which is subject to wear and usually requires adjustment, the new contactor is closed by a direct-current magnet energized through a copper-oxide rectifier, and is held closed

by the attraction of a permanently magnetized core, and the movable armature.

The permanent magnet is made of a new alloy called Alnico, which retains its magnetism indefinitely, and exerts a force approximately 40 per cent greater weight for weight than the best permanent magnets previously obtainable.

A reversal of the coil exciting current by means of a push button, or other pilot control device, causes the contactor to open by momentarily "bucking down" the flux of the permanent magnet. The new device is free from the usual transformer hum experienced in alternating current contactors, and has no coil losses while closed.

Continental "Do-All" Deep Throat Band Sawing and Filing Machine

The machine illustrated is a new "deep throat" model of the Continental Do-All machine made by Continental Machine Specialties, Inc., 1301 S. Washington Ave., Minneapolis, Minn. This machine performs the function of internal and external precision band sawing with narrow blade band saws, and is also a precision band filing machine for internal

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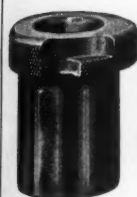
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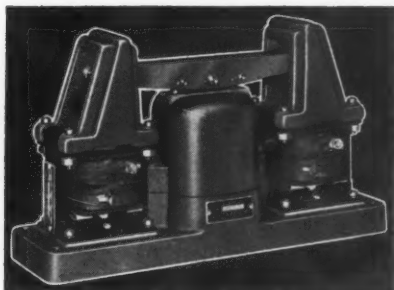
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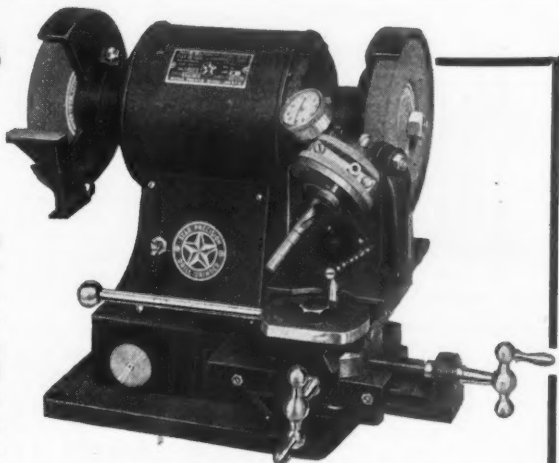
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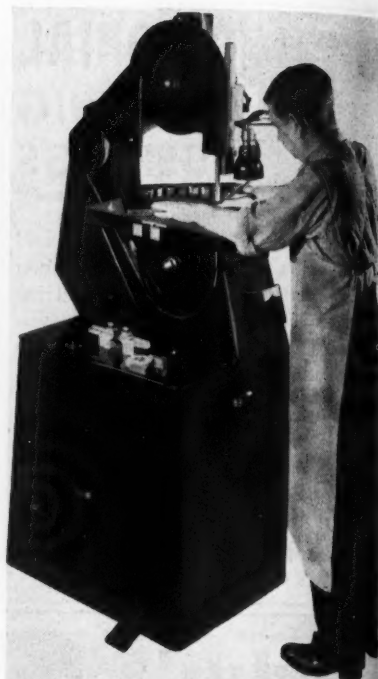
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NEW JERSEY

and external filing. Band polishing can also be accomplished, making it possible to impart a high polish to a steel surface preparatory to making a layout. The machine may be changed from one function to another in a minimum of time.

The machine is equipped with a 21x21 in. work table and has a throat 18 in. deep. This depth of throat is made possible by a third idler pulley mounted on the extra-deep frame. The abrading band—file, band saw or band emery cloth—can be operated without this third idler wheel for jobs of usual size when extra depth is not needed.

The technique and function of narrow



Continental "Do-All" Deep Throat Band Sawing and Filing Machine

blade precision band sawing is said by the manufacturer to be radically different from ordinary metal band sawing. Inside sawing is accomplished by cutting the band saw blade, inserting one end through a starting hole in the work, and rewelding the saw blade in a self-contained automatic electric brazing device. The file band is not a flexible file.

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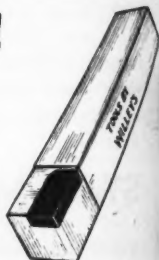
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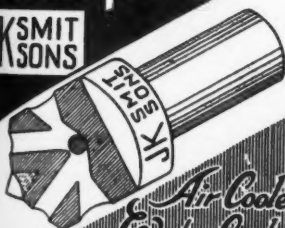
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All Types of Flexible Shafts Made to
Specification.

Walker-Turner Co., Inc.

Plainfield

New Jersey

but is made of 26 3-in. segments of files which are mounted on a flexible steel band. The file band will not stretch; every inch of file surface is used, and there is no wear from "drag back." Inside filing is done by uncoupling the file band at a point where a bayonet type of joint is provided and hooking the band together after inserting it in the hole to be filed.

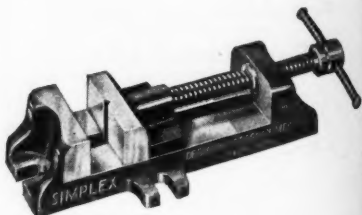
The machine is equipped with a geared transmission unit, the speed being infinitely variable from 75 to 450 ft. per minute. Speed changes can be made instantly. An air pump is located in the base with an air jet at the point of the work. An automatic power work feed provides control for any pressure. Standard equipment includes an automatic electric saw brazing machine which contains a saw lap grinding device driven with a separate $\frac{1}{4}$ h.p. universal motor and welding transformer unit to operate on any current required.

Simplex Machine Vise

The illustration shows the Simplex Machine Vise which has been brought out by The Desmond-Stephan Mfg., Co., Urbana, Ohio, for use on drill presses

and milling machines. The vise is designed for strength, ease of operation, and long life. The jaws are $3\frac{1}{2}$ in. wide with a $4\frac{1}{2}$ -in. opening and a $12\frac{1}{2}$ in. overall length.

The bottom of the vise is provided with "T" slots which run in both direc-



Simplex Drill Press and Milling Machine Vise

tions. A removable bronze nut insures easy operation of the screw and can inexpensively be replaced when worn. A 90 deg. "V" slot in the movable jaw provides for holding cylindrical pieces in a vertical position. The vise weighs 16 pounds.

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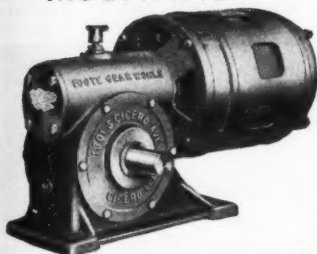
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Oil cannot enter the motor from the reducer housing.

Motor can be placed and removed without disturbing the reducer assembly.

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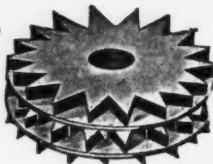
Magna-Sine

Robbins Engineering Company, 637 Mt. Elliott Ave., Detroit, Mich., has brought out a magnetic sine table which can be employed to hold a magnetic material at any required angle—either single or compound—for purposes of grinding, lapping, machining, or inspection of flat surfaces, radial holes, bevels, and other surfaces which are angular

in relation to the base surface. With this tool, called the Magna-Sine, any set-up can be completed within a few minutes. By placing standard gage blocks under the Magna-Sine rollers, any desired angle can be quickly and

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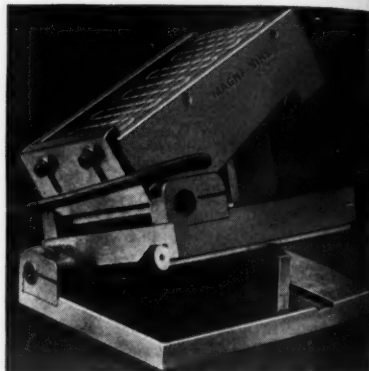
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Magna-Sine

easily determined. The material is then placed on the sine table where it is held in place by magnetic force at the turning of a switch, ready for processing or inspecting.

The Magna-Sine is built to precision limits, thus all angles are obtained by the use of standard gage blocks and extreme accuracy is always maintained. Due to the manner in which the set-ups are made, work can be checked before it is completed by simply checking the gage and position of the blocks. A rheostat may be used to regulate the degree of magnetism, facilitating the production of true surfaces even on very thin sections.

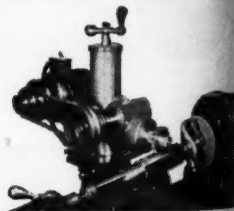
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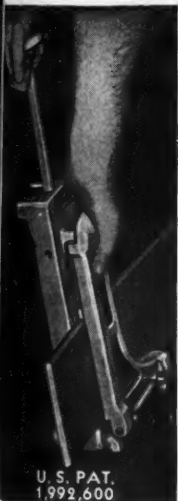
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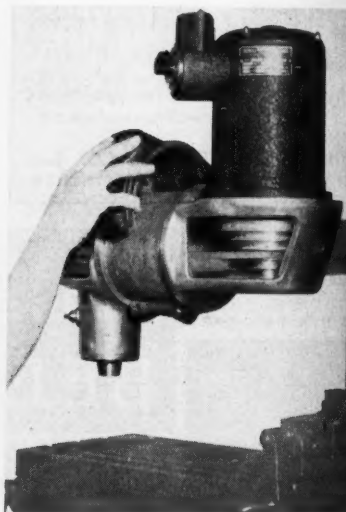
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netic principle eliminates the need for angle plates, clamps and bolts. Material to be ground is in no way distorted and there is nothing to interfere with the operation. The Magna-Size available in three models: A-5, A-10 and B-5. The A-5 and A-10 models are used to obtain both single and compound angles. The rollers, which are the pivot centers, are spaced exactly 5 in. apart on the A-5 model and 5 and 10 in. apart on the A-10 model. The B-5 model is used only when single angles are required.

Improved Dalrae Speedmill

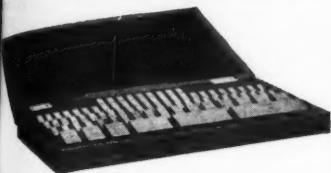
The usual disadvantages of machine attachments—bulk and weight—are said to have been minimized in the design of the improved Dalrae Speedmill now

**Improved Dalrae Speedmill**

being marketed by Dalrae Tools Company, Syracuse Bldg., Syracuse, N. Y. The Dalrae Speedmill, illustrated here, with, can be mounted by one operator without help.

The Speedmill is mounted in two parts, thus dividing the weight of the attachment. It is said that the complete unit can be mounted on the overarm of a milling machine in 56 seconds. The improvement in design also permits the use of heavier castings which provide increased rigidity and eliminate the pos-

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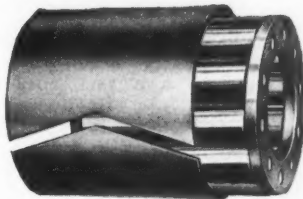
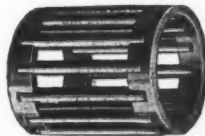
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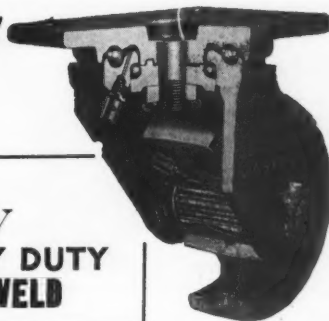


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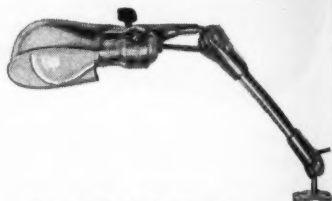
sibility of chatter and vibration.

Six speeds are now provided instead of the five available formerly, from 350 to 4000 r.p.m. Research into the causes of end mill breakage has indicated that such breakage is usually caused by speeds that are too slow; thus the new Dalrae Speedmill has been designed to provide the necessary speeds.

No. 16 Fostoria Machine Lamp

Catering to the increasing trend to localized lighting, a new, smaller machine lamp is now being produced by The Fostoria Pressed Steel Corporation,

Fostoria, Ohio. This lamp, the No. 16 Fostoria Machine Lamp, is intended for use on any machine where a small size localized lighting unit is desirable. Actually a smaller edition of the Fostoria standard lamps, the new lamp follows closely the design made popular by earlier models. Ball and socket joints are retained for maximum flexibility with sufficient rigidity to withstand the



No. 16 Fostoria Machine Lamp



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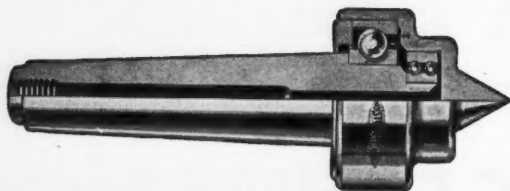
shocks and vibration of modern machine operation. The specially designed Fostoria reflector, reduced in size, offers direct glareless light with either 15 or 25 watt bulbs.

The base of the lamp is drilled with $\frac{1}{4}$ -in. holes so that it may be bolted directly to equipment or to a special clamp that eliminates the necessity of drilling equipment for attaching. Standard colors are black and green although the lamp may be furnished in any finish desired, including chromium.

Ultropak Measuring Microscope

The illustration shows the Ultropak Measuring Microscope which is now being marketed by E. Leitz, Inc., 60 East 10th St., New York, N. Y. This simple microscope provides the maximum of flexibility with the possibility of obtaining measurements of finest accuracy. Objects of considerable size are supported by a large rectangular base plate

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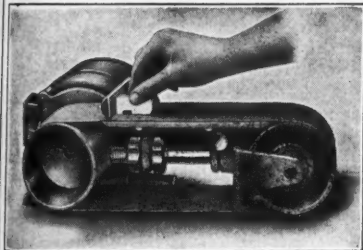
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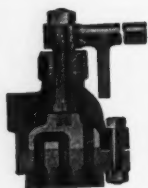
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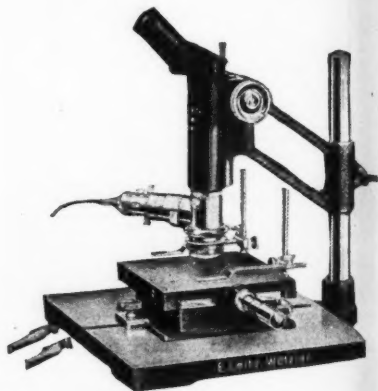
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9x10 in. The plate is provided with a groove for a clamp with which a special measuring object stage can be held.

The microscope tube with coarse adjustment is mounted upon an arm which extends from a vertical pillar, permitting adjustment in height within wide limits so that objects of considerable depth can be examined. Observation is made more comfortably by the use of a tube with an inclined eyepiece. Two types of work holding plates are available, one having a micrometer spindle and the other with two microm-



Ultropak Measuring Microscope

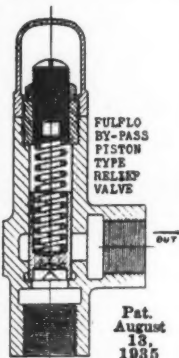
eter spindles at right angles to each other. Each spindle has a range of movement of 25 mm. and the graduations permit readings of 0.01 mm. Special object clamps are also provided for holding the work in position.

Floor Stand for Ames Milling Machines

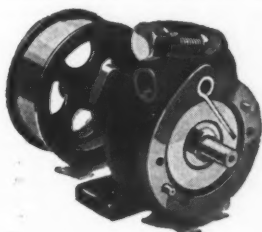
B. C. Ames Co., Waltham, Mass., has brought out a rugged cast iron floor stand especially intended for mounting Ames Milling Machines. The base of the stand is made in two pieces, the base proper in one piece and the pan in the other. These parts are so designed that the milling machine is mounted on the top of the pan, while the two-speed gear transmission is mounted on the inside of the pan. Motor and electrical controls are mounted in the base, there being no electrical connection or wiring between the pan and the base. No pro-

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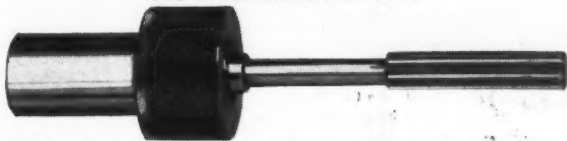
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The enclosed type floating holder has the float and drive on the front part of the collet. This balances the tool permitting it to align easily and making the tool very sensitive.

Enclosing the collet in the body reduces the projected length of the holder, giving more clearance for the tool to pass when revolving in the turret head of a screw machine.

The above mentioned tool together with numerous others is shown and described in our catalog No. 105.

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vision is made for coolant pump or reservoir as the machines are generally used on light tool and model work or light production work which is processed without coolant.

From a service standpoint, should adjustments or replacements become necessary, removing the four screws which hold the pan to the base will allow the pan to be removed from the base for mechanical or electrical repairs or alterations. The stand provides a substantial, efficient means for mounting the precision bench miller, is free from vibration, and makes it possible to install

the machine in line with other tool room or production machines.

The illustration shows the stand sup-



M-D Facing Heads

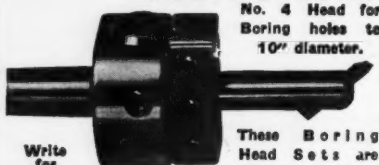
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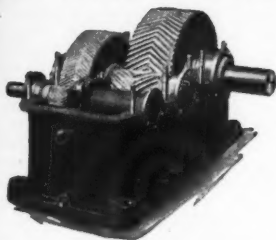


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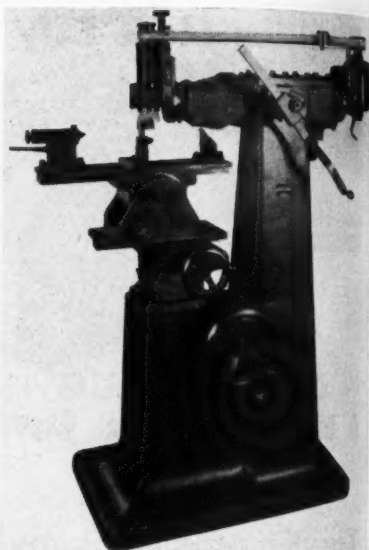
Detroit

Chicago

Oliver Universal Cutter Grinder

The illustrations show the Oliver Universal Tool and Cutter Grinder, which has been developed by Oliver Instrument Company, Adrian, Mich. The design of this machine deviates from the standard type of cutter grinder in many ways, the machine being intended especially for the rapid and accurate grinding of the general run of cutters and reamers. The feature of the machine is a universal fixture which can be adjusted in all directions and which is arranged to hold a few simple tool holding fixtures.

The grinding wheel is reciprocated by



Oliver Universal Tool and Cutter Grinder

means of a ram, the wheel being mounted at the front and the motor at the back, the two being connected by a belt. Ram, spindle and motor are all located above the grinding wheel and away from the flow of emery dust. They are also carefully protected against dust and dirt. When grinding a cutter, the work is directly in front of the operator and the tooth being ground is always in view. It is not necessary to stoop or sit in order to see the contact of the wheel with the work or operate the machine efficiently. The lip rests are especially designed and sufficient equipment with short strong rests is provided to handle any cutter easily. Clear-



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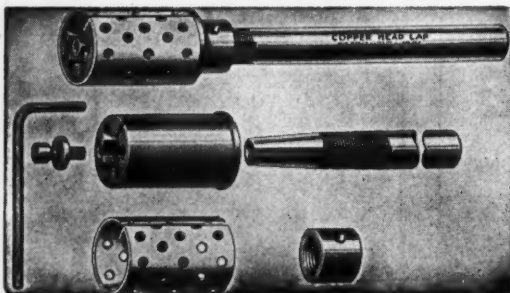
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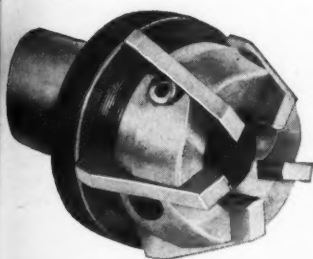
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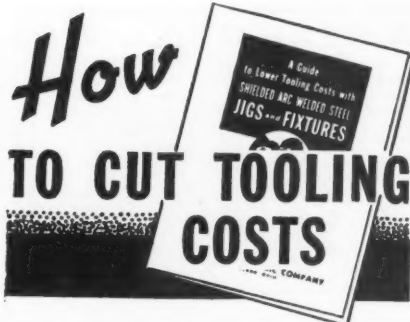
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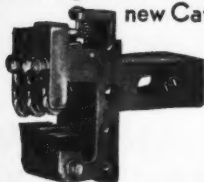
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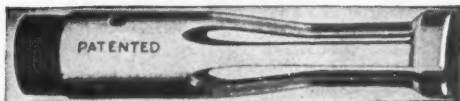
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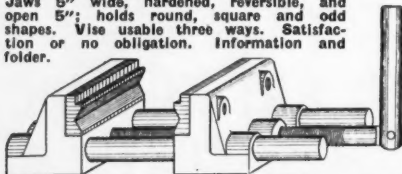
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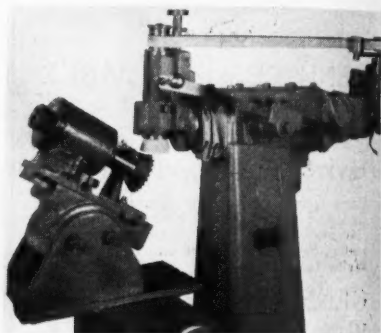
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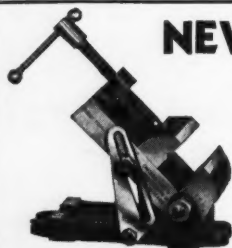
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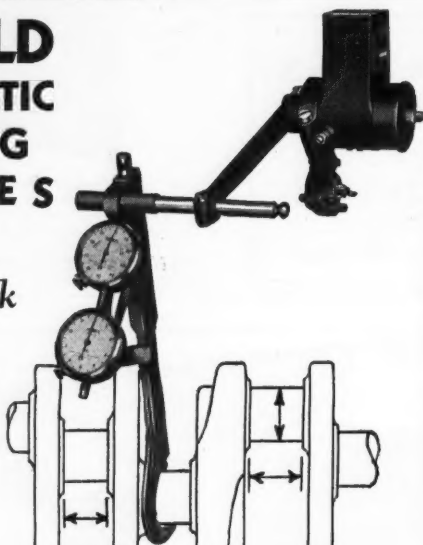
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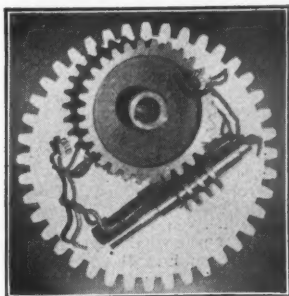
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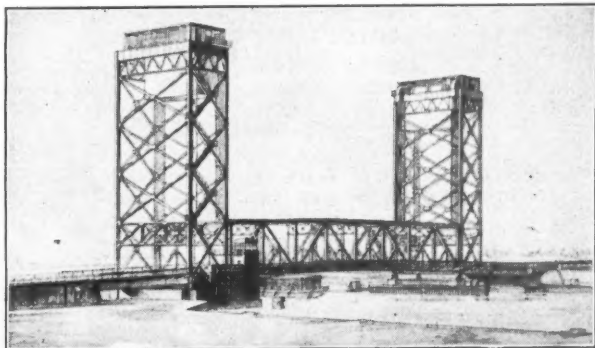
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